GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

GE 120 POWER SUPPLY

0897213 D
0897214 S
0896248 S
0896249 W

DESCRIPTION
INSTALLAT.
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PARTS

1

Information Systems

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GE 115/3 - 120 - 130
POWER SUPPLY SUBSYSTEM

CROSS REFERENCE

This publication is applicable to those product having the following model numbers:

- 0897213 D - 0897214 S - 0896248 S - 0896249 W

This publication is composed of 2 volumes termed as follows:

Volume 1	T.o.C.	4.409.2.002.3
Description		
Installation	See C.P.U.	
Maintenance		
Parts	See C.P.U.	
Volume 2F	T.o.C.	4.409.2.003.4
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GE 115/3 - 120 - 130
SOTTOSISTEMA ALIMENTATORE

INDICE DI RIFERIMENTO

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Volume 1 Indice 4.409.2.002.3

- Descrizione
- Installazione (vedi U.C.)
- Manutenzione
- Catalogo (vedi U.C.)

Volume 2F Indice 4.409.2.003.4

- Sottosistema
- Schemi

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GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

GE 115/3 - 120 - 130
POWER SUPPLY SUBSYSTEM

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Window

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1 GE 130 Power Supply Subsystem - Description 4.409.1.001. /A

Maintenance :

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2 Troubleshooting procedures 3.001.4.014.

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SOTTOSISTEMA ALIMENTATORE

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1. GENERAL CHARACTERISTICS

1.1. - INTRODUCTION

Direct current power supply to the GE 130 System is generated by the following separate Power Supply units, wich are in turn commanded through a controller , praticcaly composed by the ALI 040 command panel.

1) - ALI 150 : termed "switching", supplies the following stabilized voltages :
   +5.2V with max current of 21 A (23 A - Mod. B = ALI 150/B set for 64K mem.ext)
   +12V with max current of 7 A (8 A - Mod. B = ALI 150/B set for 64K mem.ext)
   -20 A with max current of 1.5 A.

2) - ALI 031 - ALI 032: termed "SCR", supplies the following stabilized voltages:
   +20 V with max current of 65 A.

By applying the extension, fitted in wing E, the max current limit is raised to 130 A.
This subsystem is explained in chapter 6.

1.2. - CHARACTERISTICS

INPUT

There phase supply	Model A = 220 V, 50 Hz Model L = 208 V, 60 Hz
Tolerance on voltage	± 10%
Tolerance on frequency	± 5%

OUTPUT

Direct current	+5.2V	+12 V	+20 V	+20 V
Max current	21 A	7 A	1.5 A	65-130A
	23A (Mod.B	8 A(Mod.B)		

Max voltage variations*	± 2%
Max ripple	50 mV
Output resistance	10 mΩ
Set up time	2 msec
Average efficienoy	70%
Mean Cos φ	0.8

(*) - The mentioned variation is intended for static conditions. Variations measured with a 30% load change do not go beyond ± 5% of the recommended nominal supply voltage.

The differences between the Model A and Model L consist in the use of a different type AC breaker and time counter.
The high efficiency characteristics of this Power Supply are a feature derived from the fact that transistors and controlled diodes function is the ON - OFF mode, with the consequent result that power dissipation is noticeably reduced.

1.3. - PHYSICAL CONFIGURATION

The Power Supply, in its elementary configuration, is housed in one wing. The SCR portion is located in the two lower modules while the Switching unit is in the upper two. See Fig. 1.1.
The command panel for the whole assembly (ALI 030) is located at the top of the wing and occupies half a module.

The ALI 030 command panel is composed of:
- the switch-ON and OFF pushbuttons,
- various display lamps,
- the ± 8% voltage protection circuits,
- individual component temperature protection circuits,
- switch-ON inhibit circuits when input voltage is out by more than ± 8%.

The SCR unit is divided in two portions:

a - ALI 032 - Supply chassis containing:

  - main input fuses,
  - main power transformer,
  - AC mains input breaker,
  - output filtering capacitors.

b - ALI 031 - Control chassis containing:

  - main power transformer secondary winding fuses,
  - power rectifiers,
  - Silicon Controlled Rectifiers,
  - SCR control circuits,
  - filter coil,
  - electromagnetic DC protection switches,
  - command transformer,
  - services voltage supply.

The Switching unit is composed of 2 ALI 150 chassis:

a - The upper chassis contains the control circuits power supply, comprizing of:

  - the protection fuses for input AC supply,
  - the AC input supply breaker,

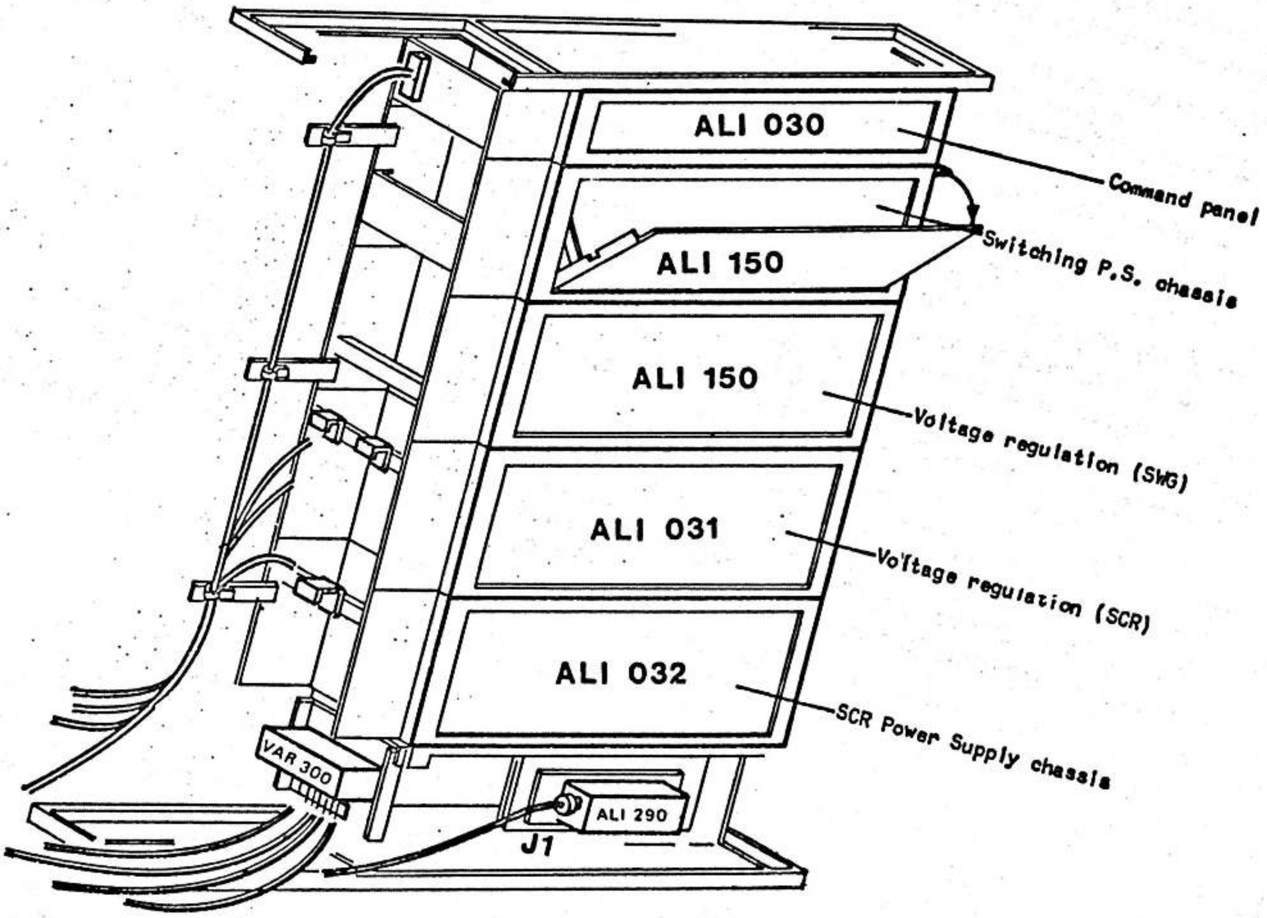


Fig. 1.1. - Power Supply layout

- main transformers,
- power rectifiers,
- auxiliary voltages rectifiers,
- slow voltage protection circuits.

b - The lower chassis contains the control circuits, comprising:

- the protection fuses for DC voltages,
- switches to change from external to internal load,
- measuring shunts for output currents,
- four adjust units (two for the +5,2V, one for the +12 V and one for the -20 V).

Each adjust unit contains:

- a switching transistor,
- a command circuit for the switching transistor,
- a current protection circuit,
- a fast voltage protection circuit.

1.4. - AMBIENTAL CONDITIONS

The GE 130 Power Supply has been constructed to operate in a temperature range comprised between +10° C and +38° C.

2. ALI 150 SWITCHING POWER SUPPLY

2.1. - PRINCIPLE OF OPERATION

The principle of operation of a switching type of power supply may be under by analyzing the diagram shown in figure 2.1.

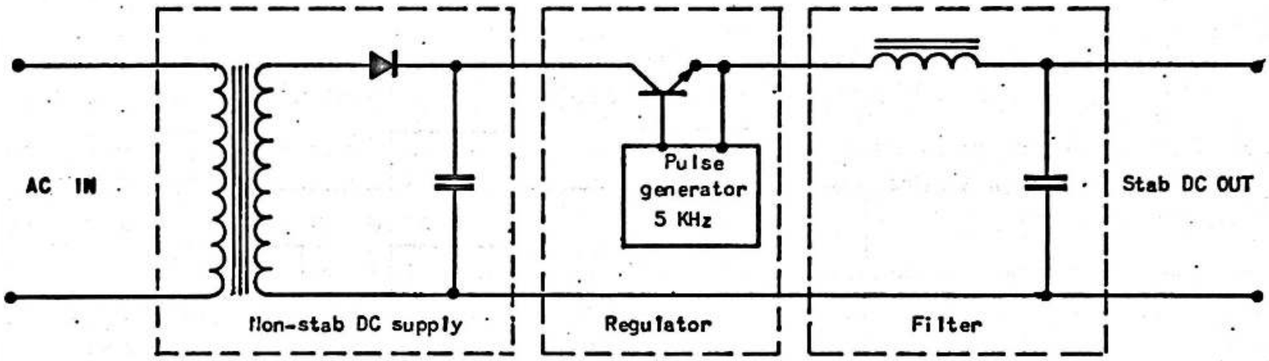


Fig. 2.1. - Switching P.S. principle of operation

As can be noticed, the diagram is divided in 3 sections:

Section 1

Made up of a non-stabilized DC power supply, supplies to the other two sections a voltage value greater than that required by the stabilized output.

Section 2

Consists of a transistor utilized as a switch. Furnishes to the filter circuit current pulses at 5000 Hz.

Section 3

Integrates the current pulses received and gives in output a continuous level the value of which depends upon the waveform of the pulses received.

The switching transistor is operated at a frequency of 5000 Hz and, under nominal input voltage and with a given output current, it charges up the filtering capacitance and the user circuit by conducting for half periods and is cut off for the remaining half period.

The filtering capacitance charges during the transistor or time and discharges, through the user circuits during the time in which the transistor is cut off.
Because the frequency of the changing pulses is rather high, the ripple on the output is contained within very small limits.
If the output voltage tends to decrease or increase because of input voltage changes or because of variation on the load current, a special circuit causes the transistor to conduct for a longer or shorter period to compensate for changes. See Fig. 2.2.

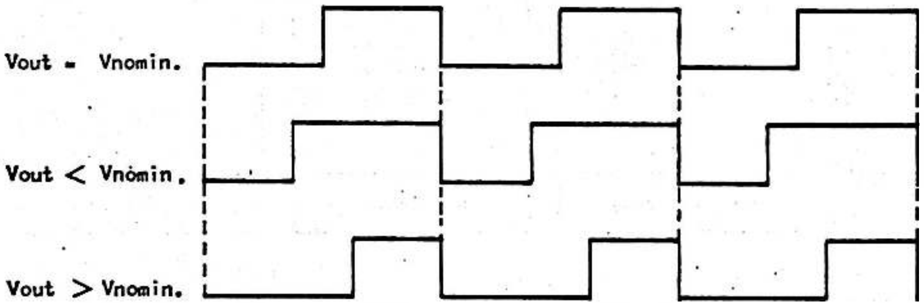


Fig. 2.2. - Switching transistor pulses

The filtering capacitance is charged through a coil to reduce to a minimum change current during transistor conduction. In this way, the capacitance charge voltage (and therefore the output voltage) is proportional to the time that the charge current is applied.
Without the coil, the charge current would take on a very high value at the moment the transistor started to conduct, with the consequence that the output voltage would instantaneously rise to the value of an unstabilized supply.

2.2. - THEORY OF OPERATION

The Power Supply gives in output 3 stabilized direct current voltage levels each of which is obtained through a switching circuit.
The electrical schematics of the 3 circuits are very similar. The differences consist in different component values as a function of the current

supplied by each circuit.
Considering the characteristics of the user circuit each of the above circuits consists of 3 main parts used for:

- output voltage stabilization,
- max current limiting,
- fast overvoltage protection,
- one or more supply voltage phase protection.

2.2.1. - Output voltage stabilization

To obtain a stabilized continuous output from any of the ALI 150 outputs, the inherent circuit carries out the following operations:

1) - Compares a part of the output voltage with a reference voltage. The result of such comparison is an error voltage the value of which is proportional to the output.

2) - Compares the resulting error voltage with a sawtooth waveform, the excursions of which are within the limits that the error can reach. The sawtooth signal is generated at a constant frequency 5000 Hz.
The result of this comparison is a square wave. The square wave assumes a low value when the sawtooth is less than the error voltage and a high value when the sawtooth is greater than the error signal. See Fig. 2.3.

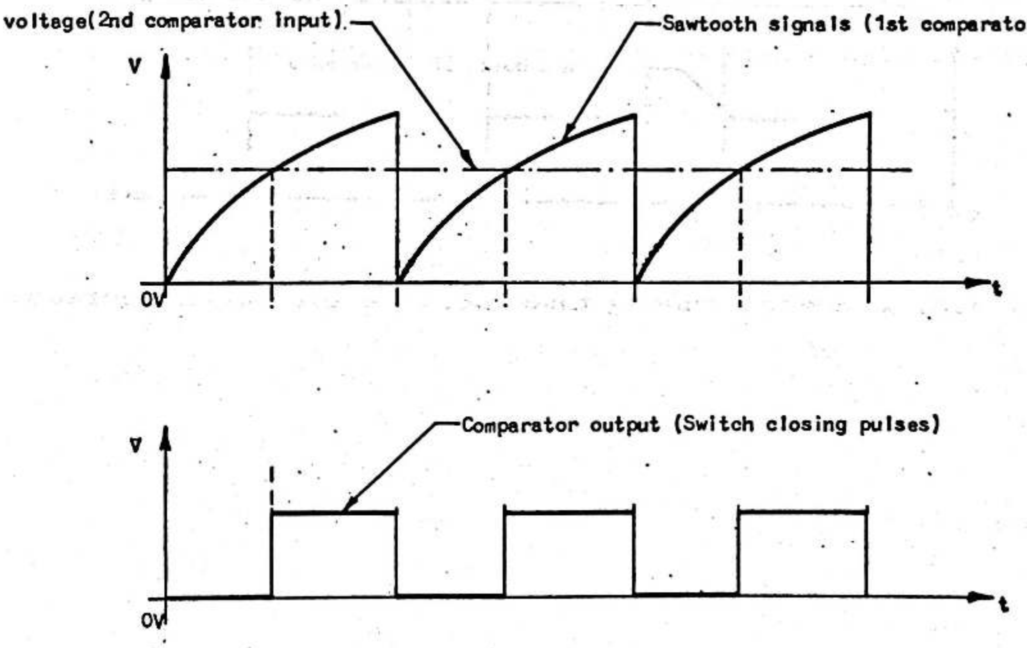

voltage(2nd comparator input)
Sawtooth signals (1st comparator input)
V
0V
t
Comparator output (Switch closing pulses)
V
0V
t

Fig. 2.3. - Relationship between error and switch closing

3) - Feeds the square wave signal to the switching circuit (a power transistor) which charges the inductance and capacitance of the filter. The filter capacitance charges during the switch closed time and discharges during the opened time.
The toggle frequency is rather high, therefore the values reached by the capacitance are relatively low with respect to the current absorbed, considering the discharge time and small voltage excursions.

The output voltage reaches a stable output condition through the following logic:

1) - If the output voltage is inclined to diminish because of a decrease in the input voltage or an increase in the output load, the error signal also decreases. As a consequence, the switch closing time increases to bring the output voltage as near as possible to its nominal value.

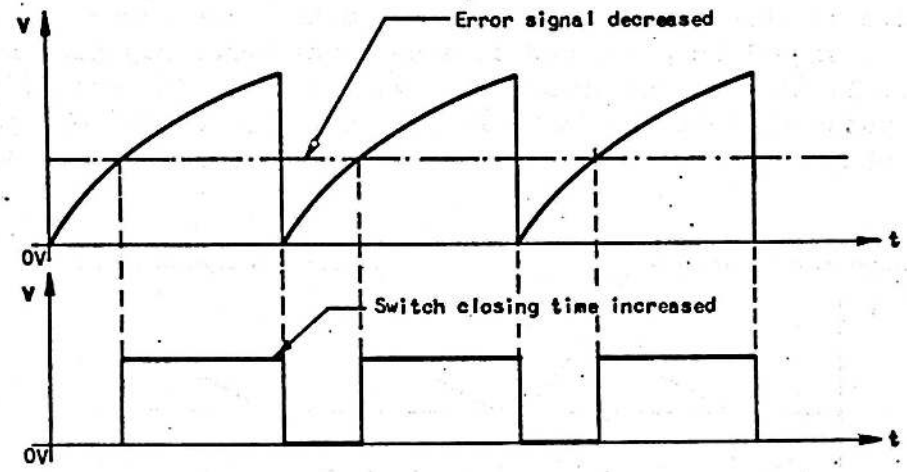


Fig. 2.4. - Switch closing time increase for output decrease

2) – If the output voltage tends to increase because of an increase in the input voltage or decrease in the output load, the resulting error signal increases. The switch closing time decreases to bring the output as near as possible to its nominal value.

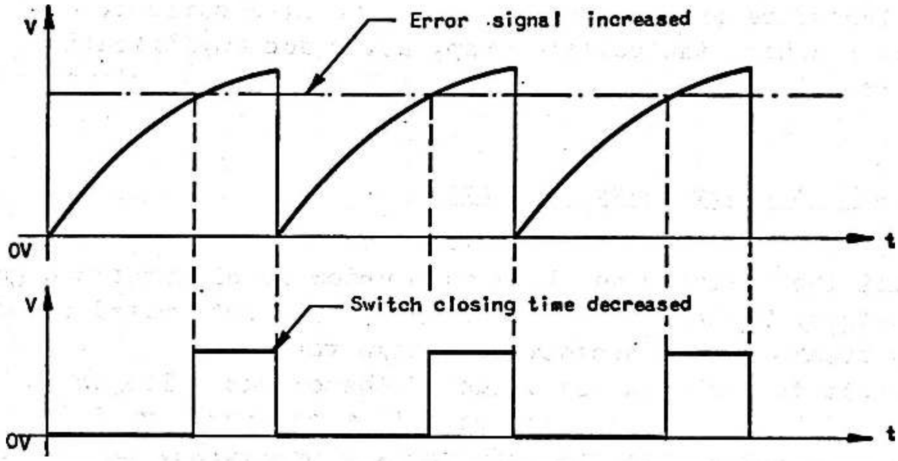


Fig. 2.5. – Switch closing time decrease for output increase

2.2.2. - Current protection

The necessity of installing a current protection derives from the fact that possible short circuits or overloads could damage both the Power Supply and user circuits.

The protection cuts-in whenever the value of the output current reaches the set limit. A further reduction in the load impedance will induce a decrease in both voltage and current until the Power Supply output is practically short circuited. The output value will be 0 V and near the max current value.

The current protection circuit senses the load current through a low value resistor, series connected to the output. The voltage drop across this resistor is therefore proportional to the generated current. When the set current value is reached, the voltage drop, after due amplification, will drive the ON-OFF transistor so as to obtain the Power Supply output described above.

2.2.3. - Fast overvoltage protection

The construction characteristics of the circuits supplied by the ALI 150 are such that the voltages supplied must under no circumstance go beyond well defined values. The circuitry is realized with integrated components which very quickly break-down if subjected to high voltages.

The circuit that checks the value of the output voltages is basically a comparator which compares the output with a reference voltage. When the output voltage is greater than the reference, a controlled diode fires. The diode is between the positive and the negative lines of the voltage under exam and rapidly shorts them to ground.

2.2.4. - Phase loss protection

An independent circuit for each of the 3 outputs of the ALI 150 (+5,2V, +12 V and -20 V) checks the presence or not of mains supply phases.

If one or more phases are missing, the circuit short-circuits its own output utilizing the same diode used for the fast voltage protection circuit.

2.3. - BLOCK SCHEMATIC

The ALI 150 Power Supply Unit is made up of the main assemblies schematized in their layout by Fig. 2.7.

- Main +5,2 volts supply	(11 A)	or (11.5 A - for Mod. B)
- 5,2V augment supply	(11 A)	or (11.5 A - for Mod. B)
- +12 volts supply	(7 A)	or (8 A - for Mod. B)
- -20 volts supply	(1.5 A)	

Each supply unit (except the +5,2V augment) is broken down in the following components, as shown in Fig. 2.8.

- Power rectifier.
- Voltage regulator.
- Current limiter.
- Fast voltage protection.
- Missing phase protection.
- Secondary voltages rectifiers.

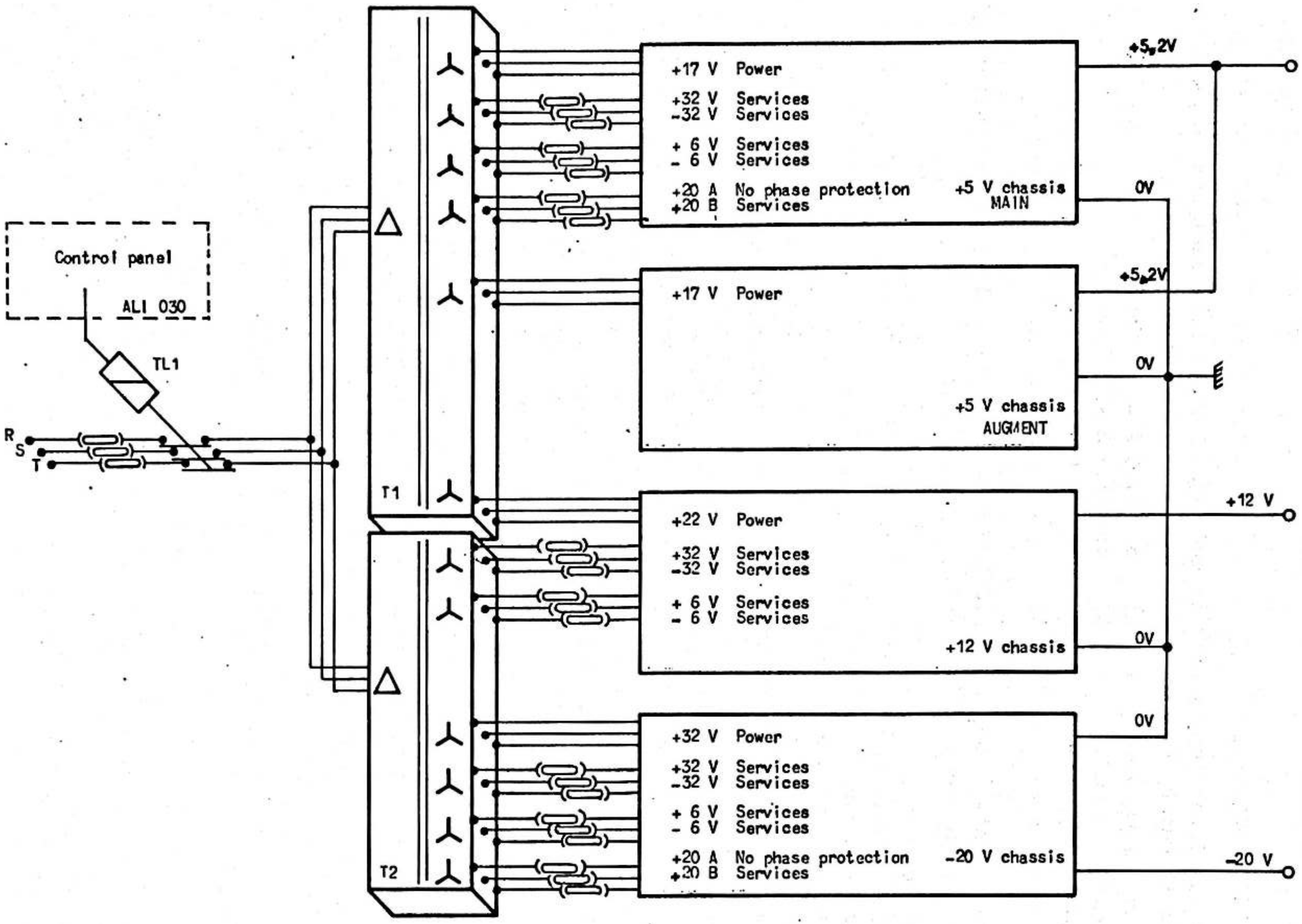


Fig. 2.7. - ALI 150 block schematic

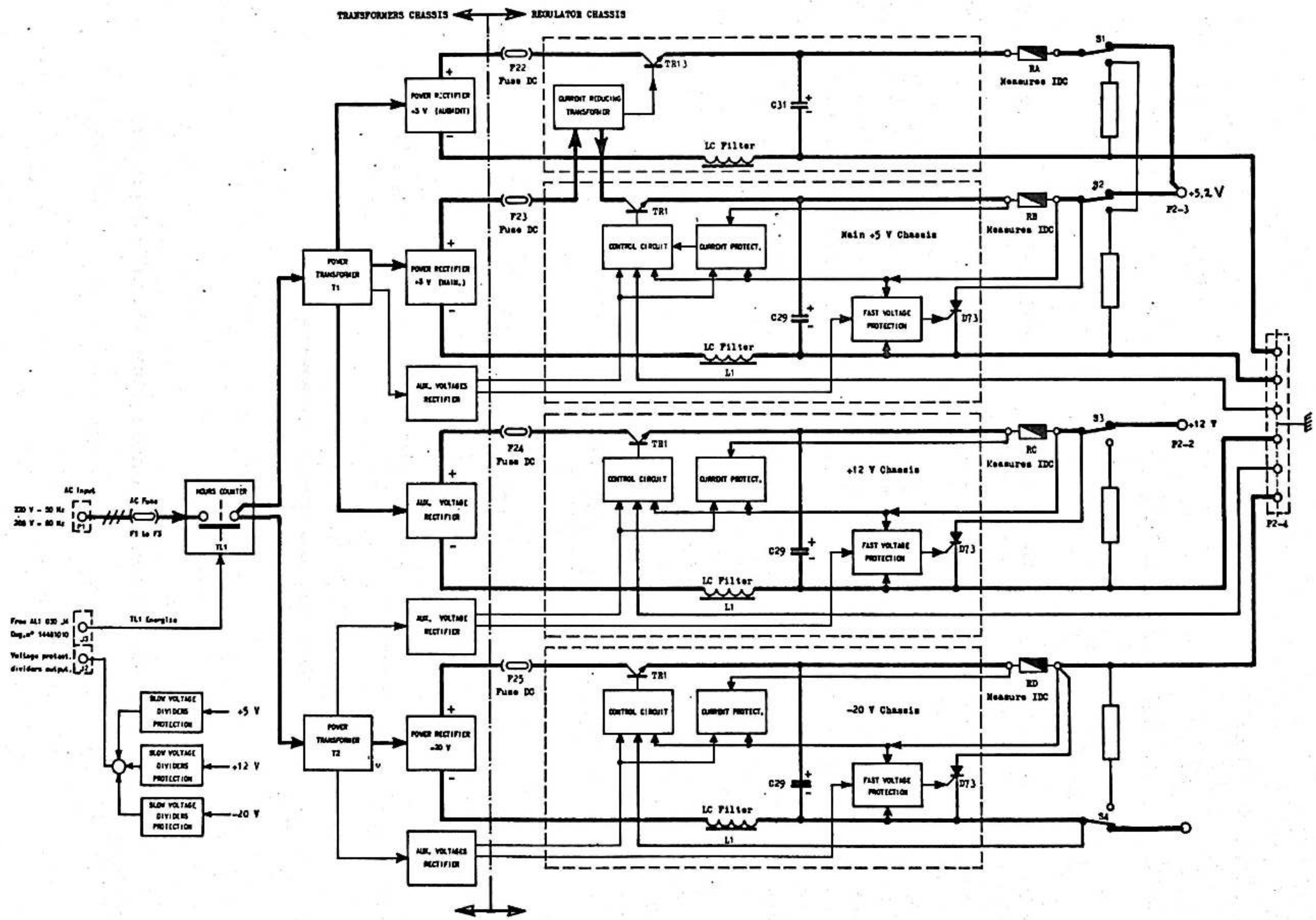


Fig. 2.8. - Power Supply block schematic

2.4. - DETAILED DESCRIPTION

2.4.1. - Voltage stabilization circuit

2.4.1.1. - Comparator - Amplifier

The comparator circuit analyzes the value of the output voltage by comparing a portion of it with the whole.
A reference voltage is obtained by summing to a divider tap a constant DC level generated by a Zener diode.
The comparison is done by applying the output voltage to the emitter of a transistor and the portion of the output to the base of the same transistor. With the output at nominal, the transistor has a very small negative bias to the base with respect to the emitter causing a given current circulation.
It is to be noted from Fig. 2.9. that the service voltages have their 0 V connected to the positive side of the output.

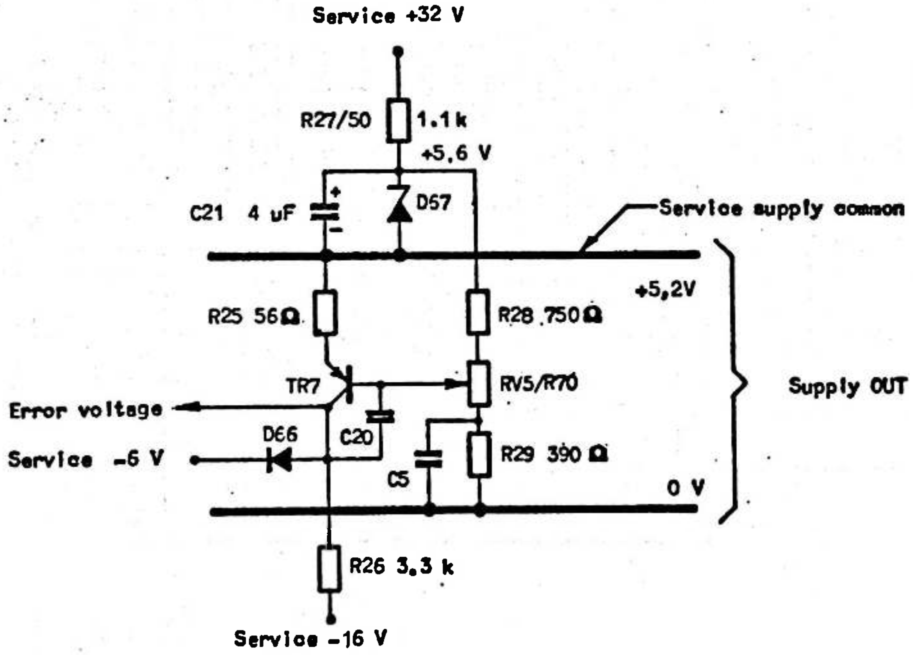


Fig. 2.9. - Amplifier - Comparator simplified circuit

The base current, amplified by the transistor, circulates in load resistor R26 for which the transistor collector has an error voltage of a defined value.

If the output voltage tries to increase or decrease:

- the emitter voltage of TR7 increases or decreases of the same value
- the base voltage of TR7 increases a decreases only partially through the action of the voltage divider made up by R29,R28,RV5 in parallel to R 70.

As a consequence of what said above:

- if the output increases, the base voltage of TR7 becomes more negative with respect to the emitter. An increased collector current flow occurs, thus increasing the resultant error voltage,
- if the output decreases, the base voltage of TR7 becomes less negative with respect to the emitter. The current circulating in the collector results decreased, thus decreasing the resultant error voltage.

Diode D66 limits the error voltage max value to -6 V while the -16 V (obtained when TR7 is in saturation) limits the min value.
To de-sensitize the circuit, so that it will not take ripple as actual voltage changes, capacitor C20 is fitted as an AC current feed-back.
The +5.6 V is derived from Zener D67 and filtered by capacitor C21.
Capacitor C5 forms a time constant with the divider resistors to give stability to the comparator circuit.
The error signal may be trimmed by means of RV5 and consequently also the output voltage level.

2.4.1.2. - Sawtooth generator

The circuit that generates the sawtooth waveform is a free running oscillator driven by a uni-junction transistor.

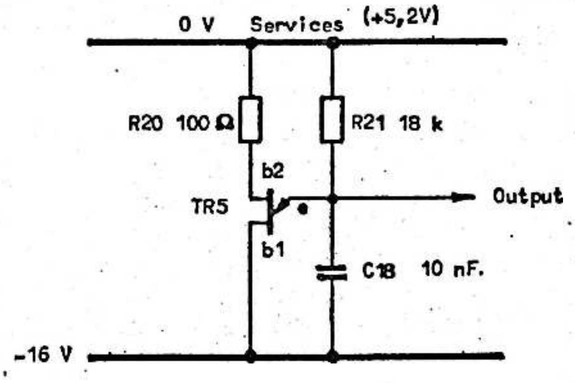


Fig. 2.10. - Oscillator simplified diagram

Capacitor C18 is charged up by R21 with a CR time such to generate the rising front of the sawtooth waveform. When the charge voltage of C18 reaches the threshold level of TR5; the transistor cuts on and rapidly discharges C18 to -16 V giving the trailing edge of the sawtooth.
With C18 discharged, transistor TR5 assumes again the cut off condition because the emitter is lower than, the threshold level.
Capacitor C18 begins to charge up again and the cycle is repeated.
Fig. 2.11. shows the type of sawtooth waveform obtained on the emitter of TR5 at test point B.

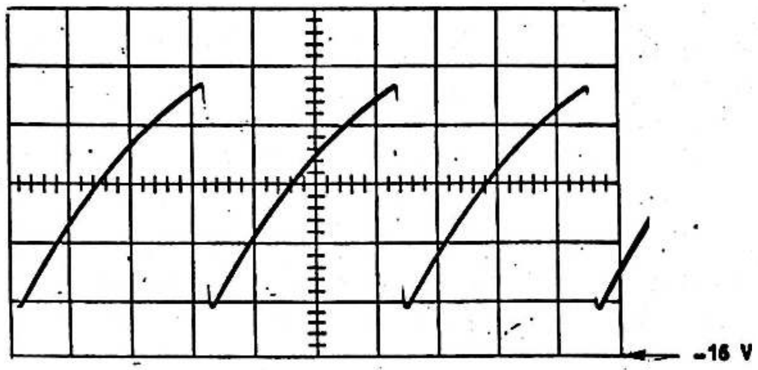


Fig. 2.11. - Sawtooth signal at TR5

The sawtooth frequency is adjustable between 5 and 7 KHz by modifying the CR time of R21 and C18. If the oscillator frequency is higher than 7 KHz it can be modified by adding a capacitor (C19) in parallel to C18.
Because unijunction transistors have threshold values that vary considerably between examples of the same type the range from 5 to 7 KHz is admitted.

2.4.1.3. - Error voltage and sawtooth comparator

A comparison is made between the instantaneous values of the error voltage and the sawtooth signal. The amplified result of this comparison is utilized to operate the switching transistor.
The comparator is essentially a differential amplifier circuit whose functions are implemented by utilizing two transistors contained in the same can. The reason for this particular construction detail is to have temperature variations effecting both transistors, thus establishing a common thermal field with self-induced gain compensation.

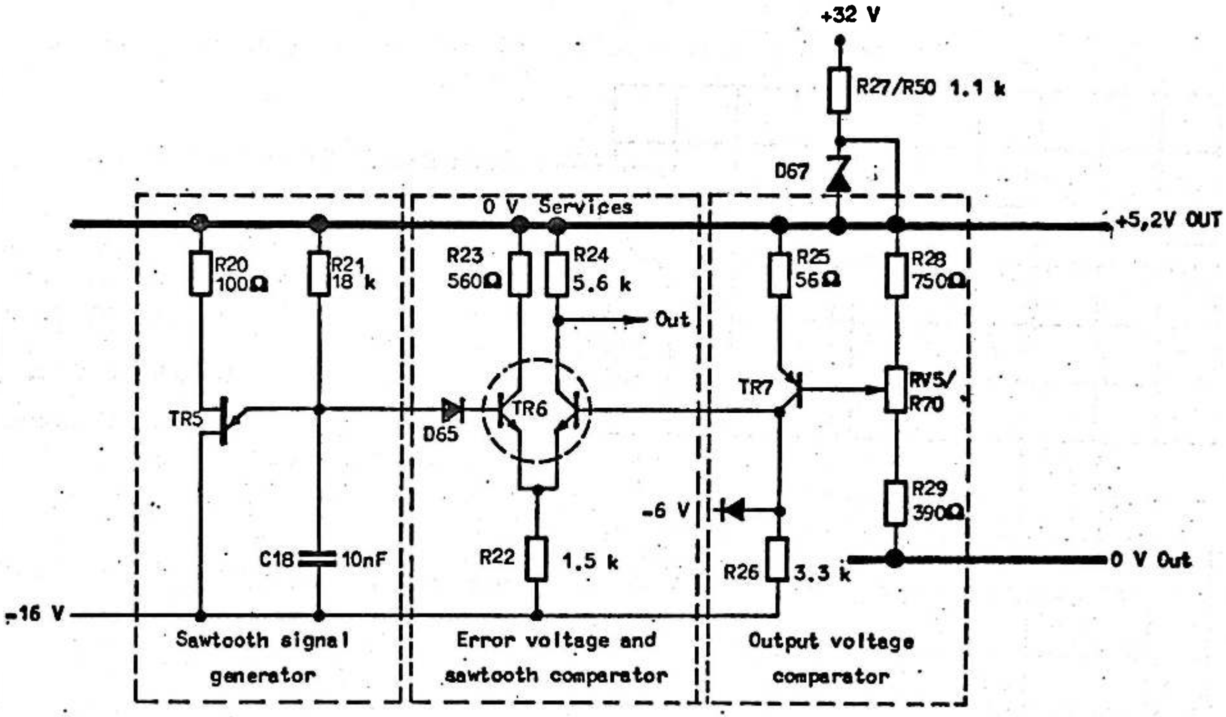


Fig. 2.12. - Sawtooth-error voltage comparator

The circuit is so constructed that only one transistor is conducting at the time. Either the left one or the right one of the TR6 group.
Take the case when the instantaneous value of the sawtooth is inferior to the instantaneous value of the error voltage, then the right hand half of TR6 will conduct giving a low output.
This is because the base potential of the RH transistor is applied to both emitters (RH and LH) giving reverse bias on the LH transistor b-e junction.
If instead, the value of the sawtooth is greater than the error voltage,both intantaneous, the LH half conducts because the LH transistor base potential is applied to the emitters of both transistors. The b-e junction of the RH transistor is reversely biased.

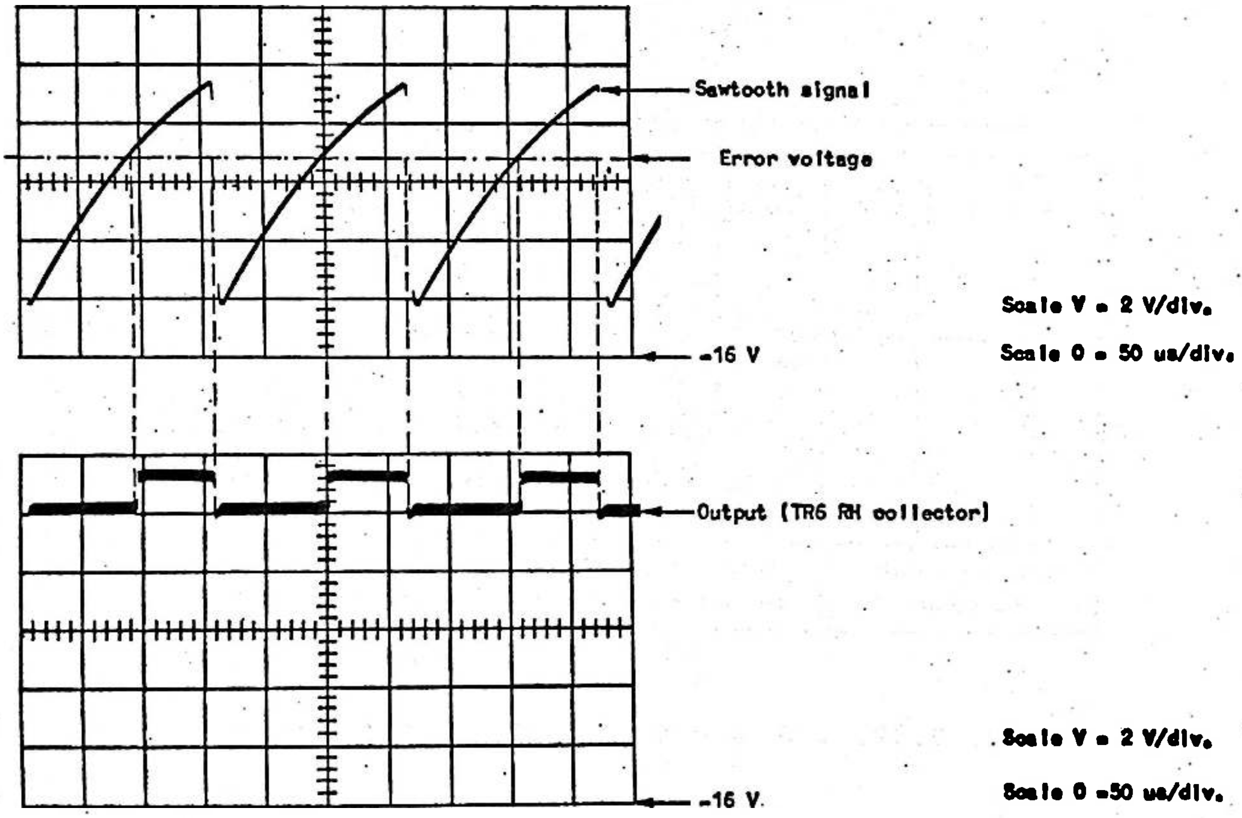


Fig. 2.13. - Comparator inputs and output

As said previously, the comparator amplified output is utilized to control the switching transistor. The result is:
- when the comparator output is high, the switching transistor conducts,
- when the comparator output is low, the transistor is cut off.

If figure 2.13. is examined, it can be seen that:
- if the error voltage increases(output voltage increase), the time in which the comparator output remains high, for each cycle, **decreases**
- if the voltage decreases(output voltage decrease), the time in which the comparator output remains high, for a cycle, remains high.

Therefore, the transistor's switching time decreases or increases for a decrease or increase in the output voltage so as to keep the output within well established limits.
Diode D6 prevents reverse Vb-e to the LH side transistor.

2.4.1.4. - Switching pulse amplifier

The square wave output of the sawtooth error voltage comparator circuit is applied to an amplifier input.
The circuit is a double inverter giving an amplified output in quadrature with the input to command the switching transistor.

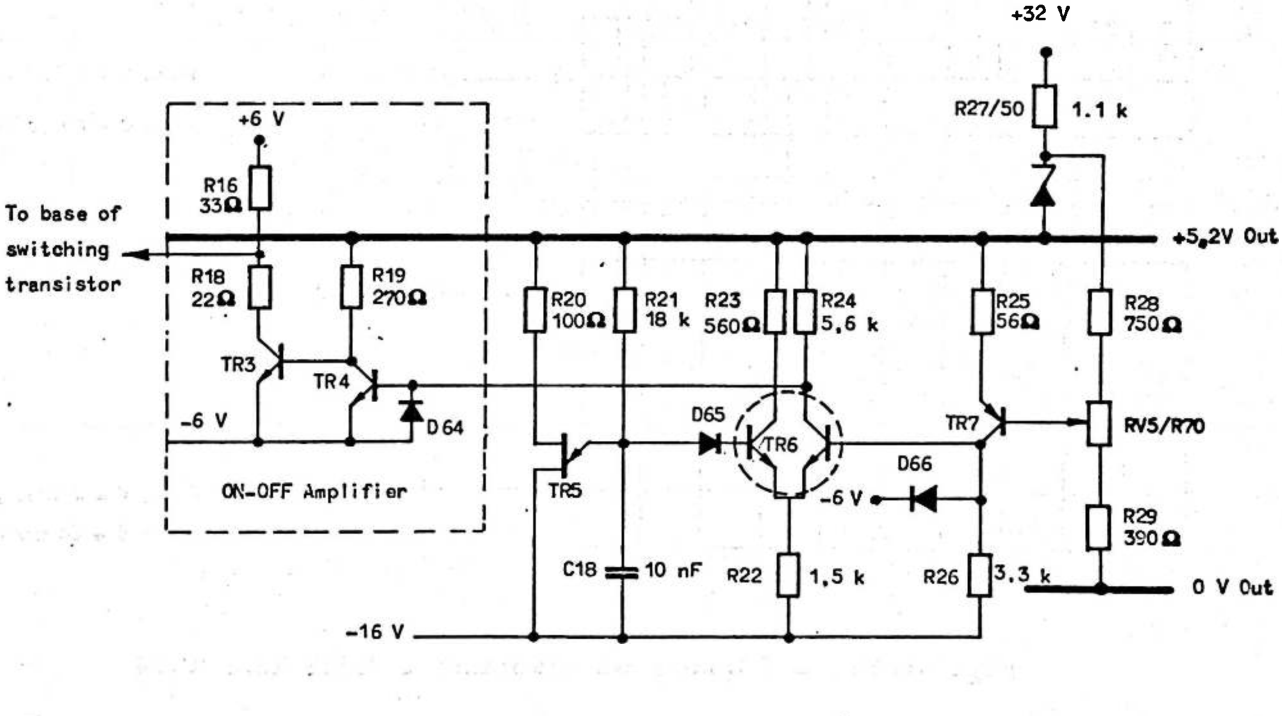


Fig. 2.14. - Switching transistor command pulse amplifier

The maximum negative excursion that the signal on the base of TR4 is set to -6 V by diode D64.
Fig. 2.15., shows the input, intermediate and output signals of the switching transistor command pulse amplifier.

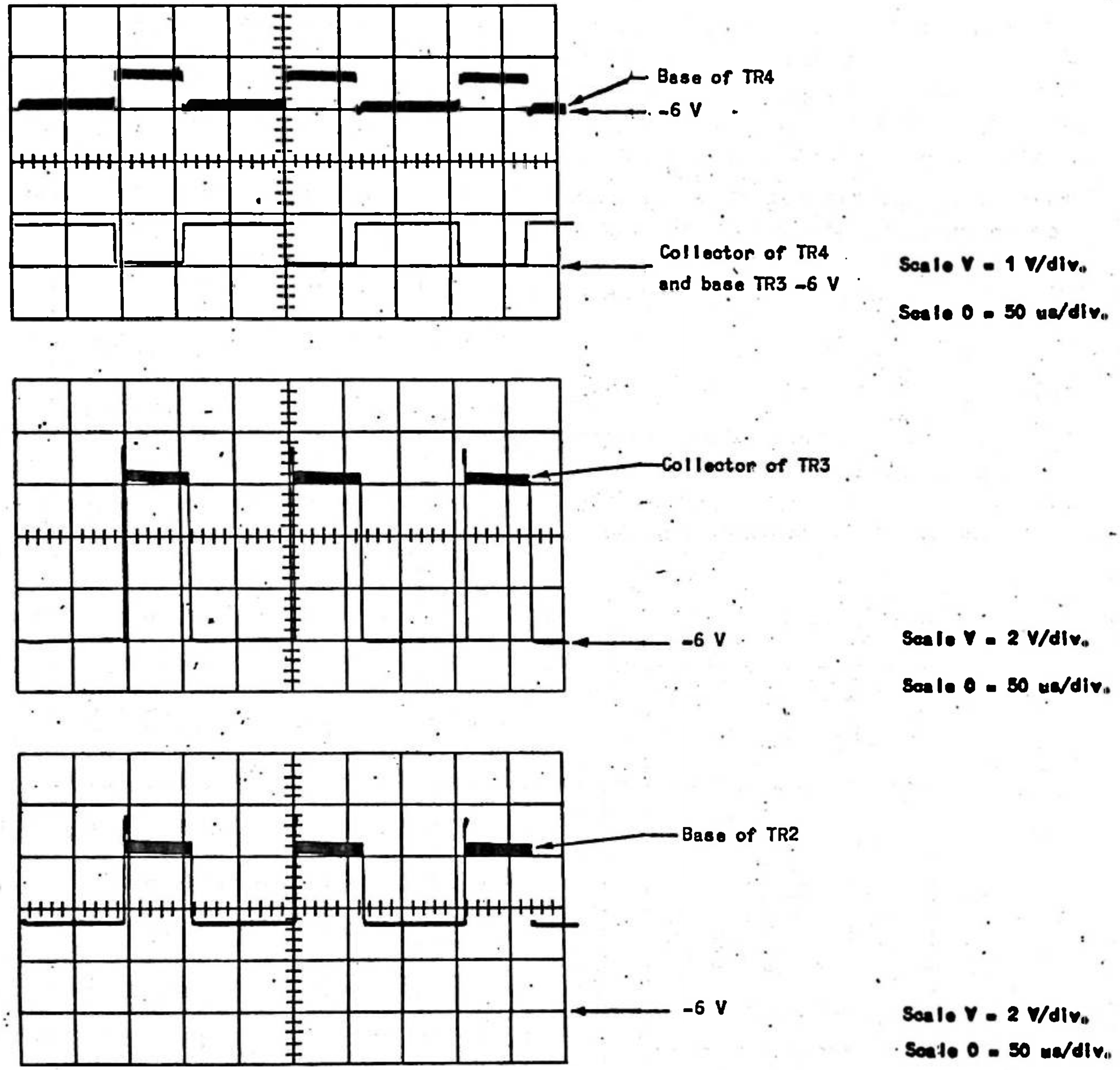


Fig. 2.15. - Signals on transistors TR3 and TR4

2.4.1.5. - Switching transistor

The transistor that acts as a switch between the non-stab and stab power supply receives its drive commands from current amplifying emitter follower.
The switch is transistor TR1. The switch is on for a high command and off for a low one.
Reverse bias for base of TR1, for low level switching command, is given by diode D63 and resistor R17.

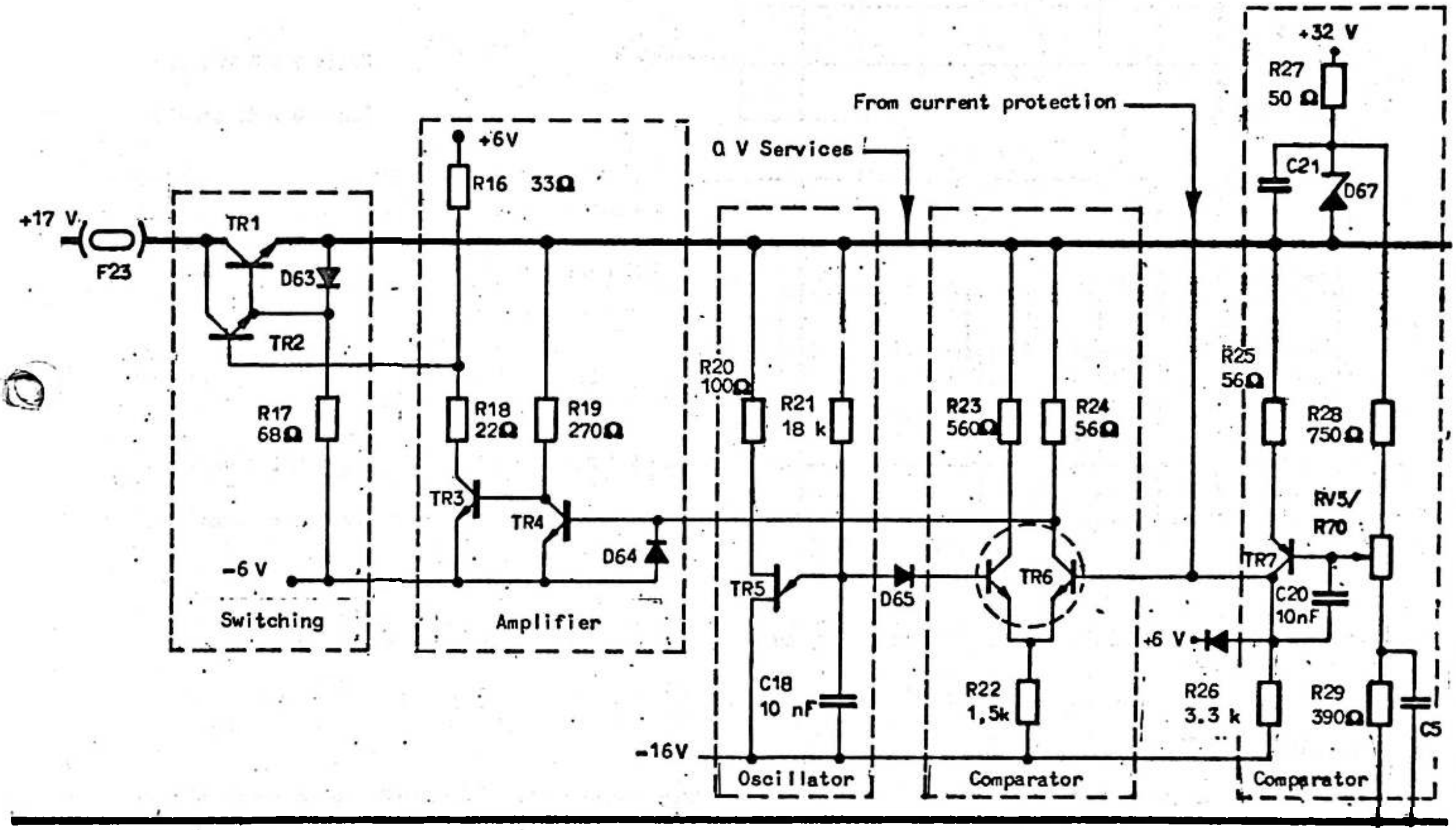


Fig. 2.16. - Switching transistor inter-circuit connections

The following figure shows the command pulse and the ON-OFF waveforms for the switching transistor itself.

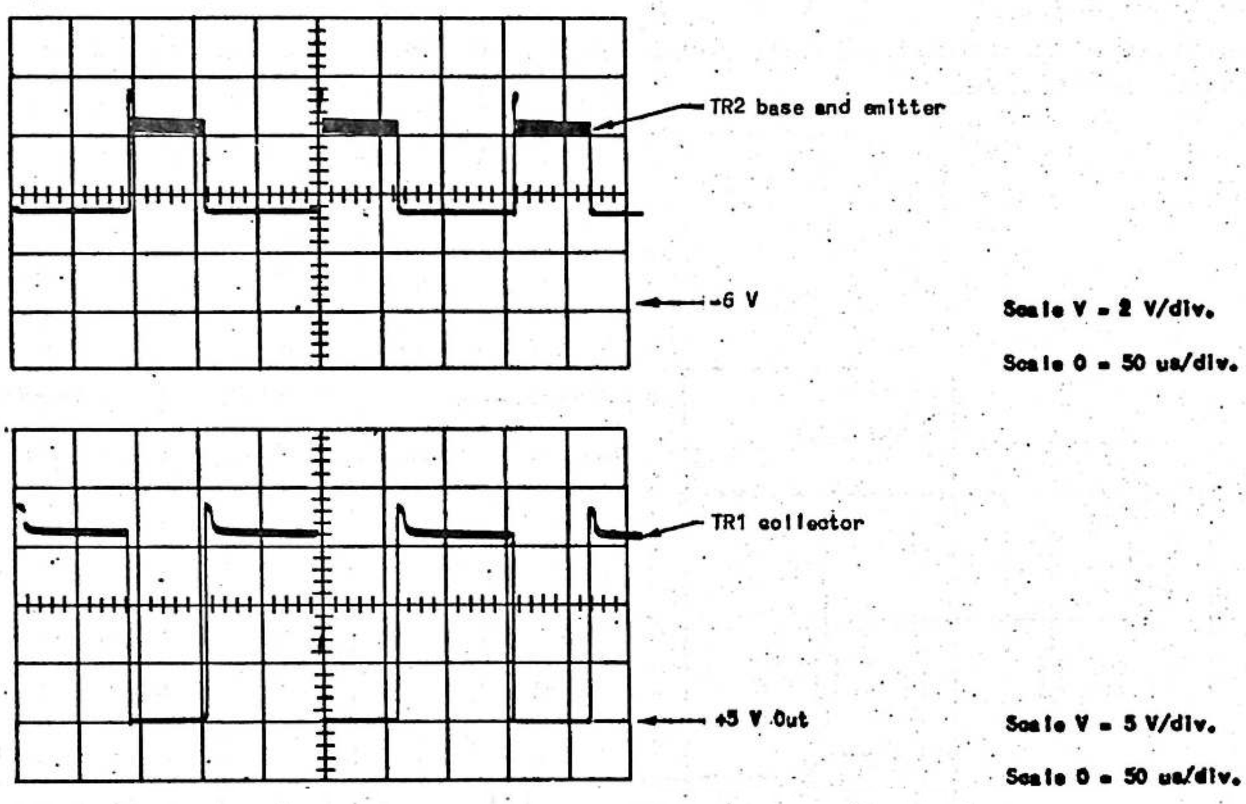


Fig. 2.17. - Switching circuit input and output signals

2.4.1.6. - Power circuit

The power circuit consists of a 3 phase star connected transformer secondary which, through a rectifier bridge, charges capacitor C2 to +17 V. See figure 2.18.

The charge voltage is applied to the filter circuit through a switching transistor. The rate of pulses is tied to the AC supply voltage and the current absorbed by the circuit.

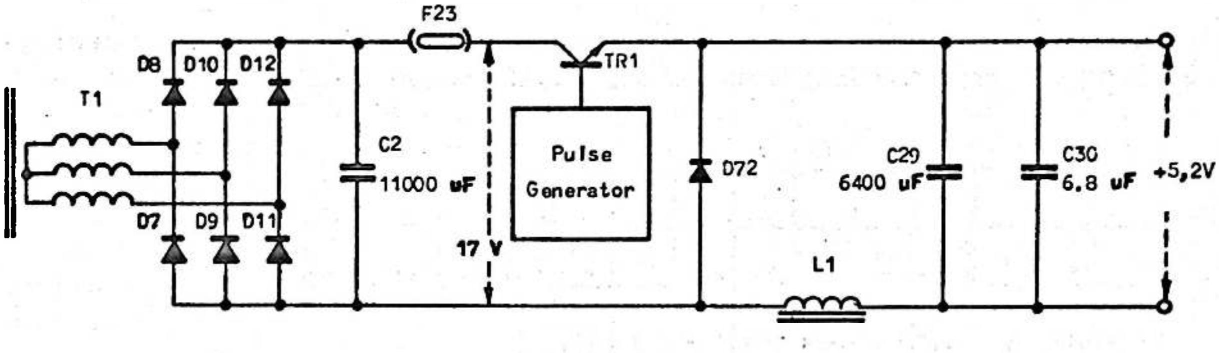


Fig. 2.18. - Simplified +5,2V power circuit

The output filter circuit consists of a coil and a capacitor:
- when the switch closes, the capacitor charges through the coil to prevent the switch's instantaneous closing current from reaching too high a value,
- at the switch's opening instant, the induced current of the coil would discharge with opposite sign to the supply if diode D72 were not utilized.

Diode D72 is reverse biased during the period in which the switch is closed. As the switch opens, it becomes directly biased because the coil, changing from utilizer to generator, inverts voltage polarity to be able to maintain the current flow in the same direction.
As a consequence the inductance continues to charge the output capacitor during the time in which the switch remains open.

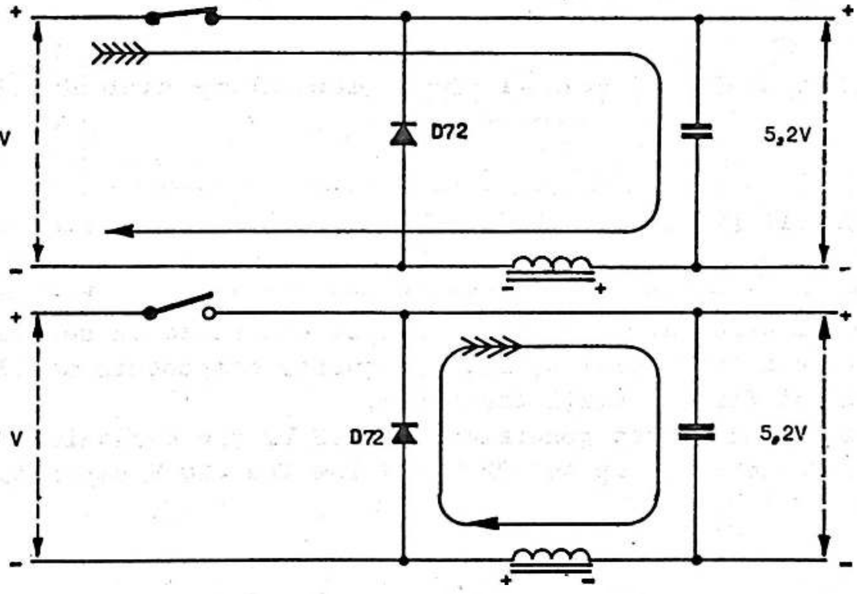


Fig. 2.19. - Current paths for switch open and closed

Voltage variations, or ripple induced on the +5,2V output by the opening and closing of the switching transistor, are shown in the following figure.

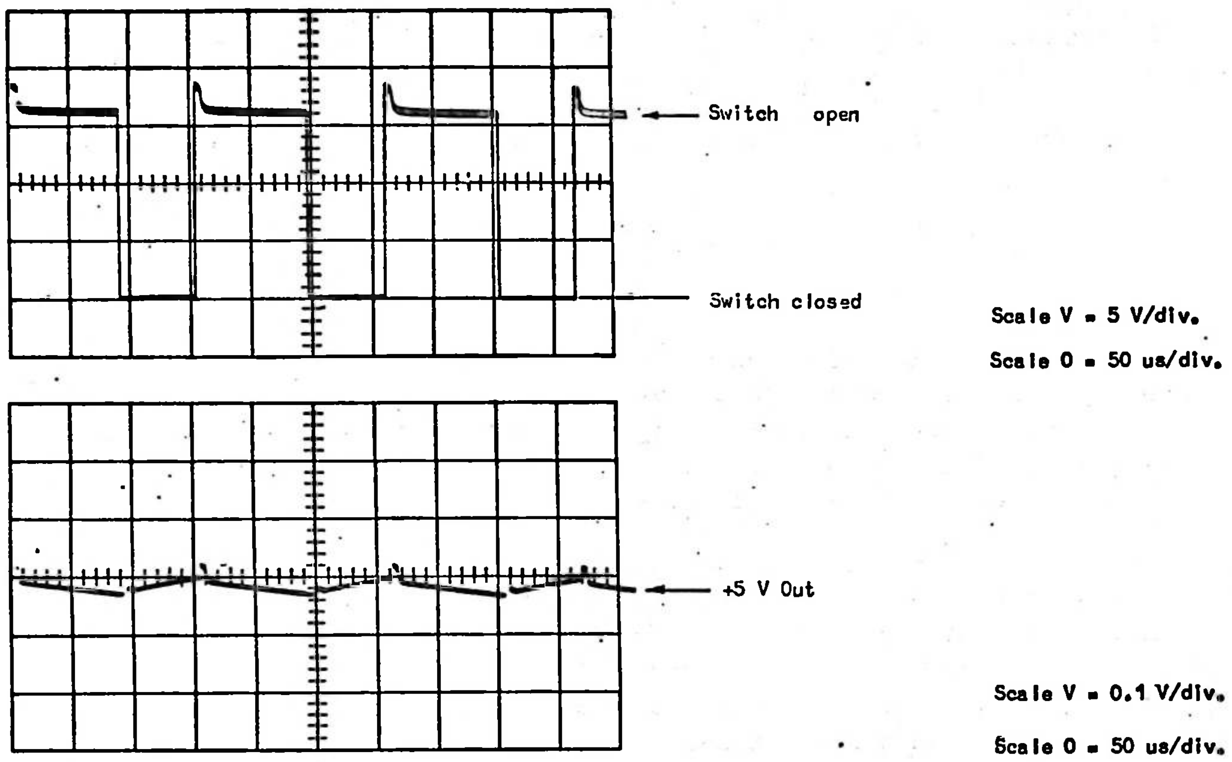


Fig. 2.20. – Output voltage ripple caused by switching transistor

The value of coil L1 is of 1 mH (See Fig.2.18.) and capacitor C29 is 6400 uF. The capacitor is in parallel to tantalum capacitor C30, 6.8 uF. It is necessary to put a small capacitor in parallel to the big one, because the latter, as a construction feature, has a small coil connected in series to it.
Because of this characteristic, high frequency components would not be filtered were it not for the small capacitor.
As far as the circuit that generates the +12 V, the equivalent capacitor C2 (See Fig. 2.18.) charges up to 22 V and for the -20 V capacitor C2 charges up to 32 V.

2.4.1.7. - +5,2VDC Potentiometer

The max current that the +5,2V chassis can output is 11 A, (11.5 A for mod. B) but because the effective current drain required is double than that given, a second power circuit has been mounted in parallel.

Command pulses to the second switching transistor are parallel fed through current transformer coupling.

When the first switching transistor closes, there is a current flow in the first power circuit and in the primary of the current transformer. The current induced in the secondary closes the switching transistor of the second circuit.

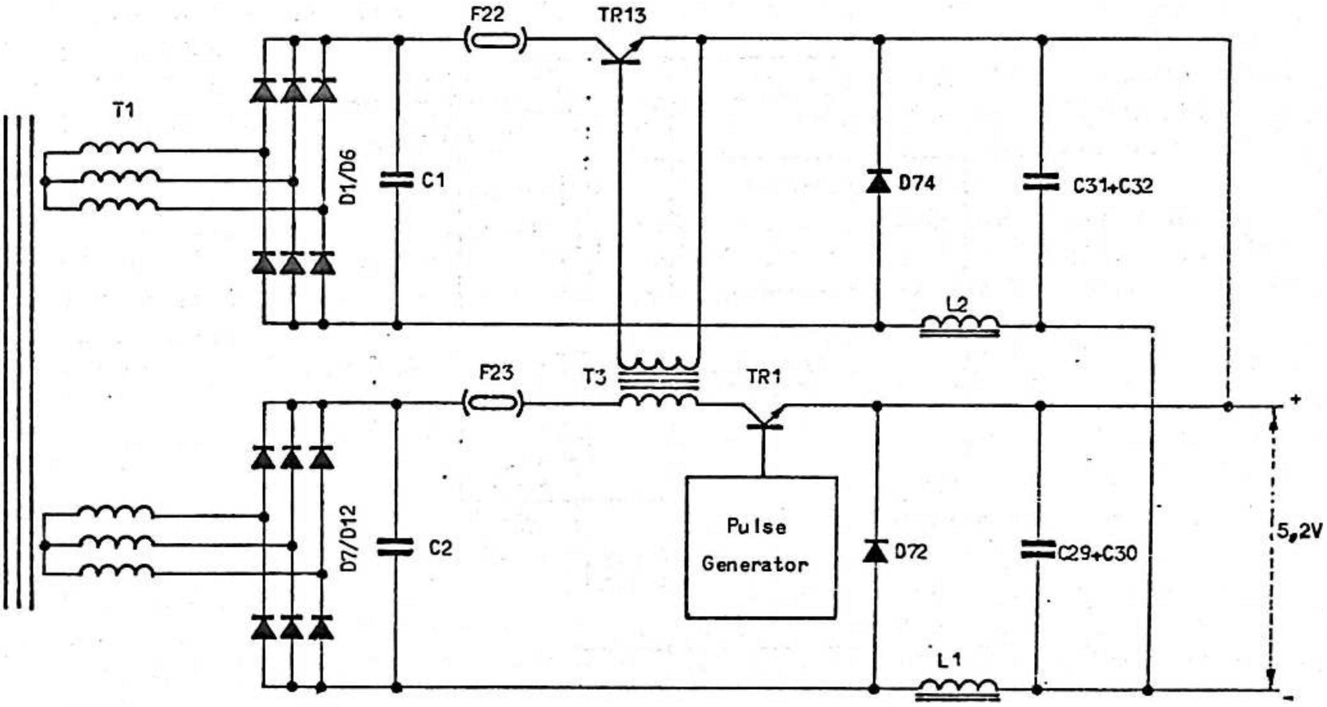


Fig. 2.21. - First circuit to second circuit action

2.4.2. - Current limiting circuit

A small value resistor, connected in series to the current under exam, is utilized to sense the value of the current given out from the circuit.
The voltage drop across the resistor is directly proportional to the current that goes through it. This drop is amplified, firstly by a differential amplifier then by a linear amplifier circuit. The result is applied to the circuit that stabilizes the output voltage to cause a reduction in output when the prefixed current level is exceeded.
Figure 2.22. shows the simplified circuit diagram of the current limiting circuit.

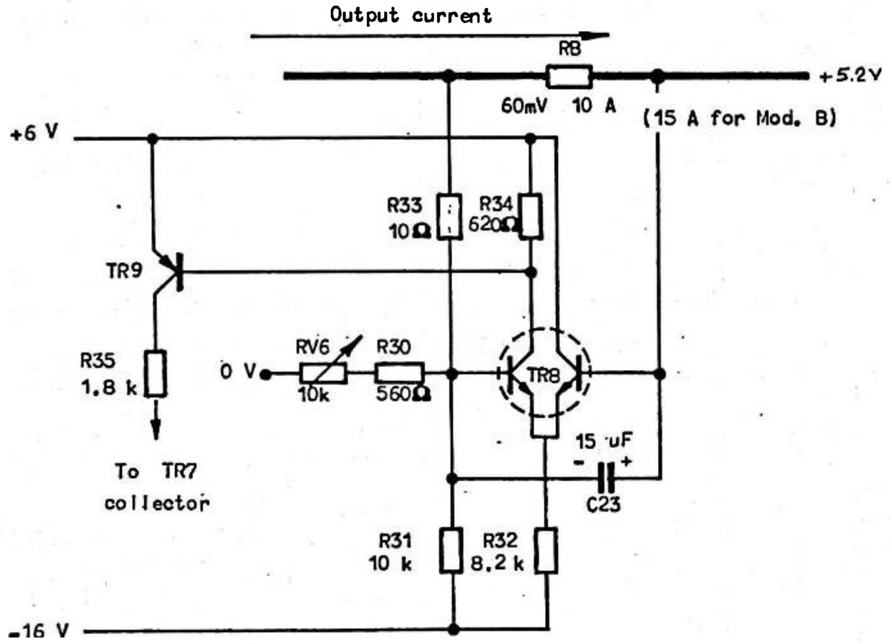


Fig. 2.22. - Current limiting circuit diagram

Series resistor RB, 60 mV 10 A (15 A for mod. B) shunt, is used to obtain the voltage drop to be applied to differential amplifier TR8.
Under normal conditions (generated current less than max), the LH transistor of the TR8 pair is nearly cut off while the RH transistor will conduct very near to its maximum potential.

This condition is obtained by biasing the base of LH TR8 slightly less negatively than the base of RH TR8. This balance is obtained by trimming pot RV6 whose action is through resistive chain R30 - R31 and R32. With the above conditions prevailing, the potential on the collector of LH side TR8 is +6 V and transistor TR9 is cut off.

The output of TR9 is applied to the input of the sawtooth-error voltage comparator (V out regulator).

The current limiting circuit has no effect on the voltage regulator when transistor TR9 is out off.

When the current output reaches the nominal running value, the voltage drop across series resistor RB reaches such a value to cause the base of the RH half of TR8 to be more negative than the LH half.

In this case, the LH side transistor conducts more than the RH side with the consequence that transistor TR9 conduct linearly.

The conduction of TR9 raises the value of the error voltage to be compared with the sawtooth signals. This gives the results that the switching transistor conducts for a reduced period of time . It lowers the P.S. output voltage thus preventing the current from going beyond the maximum prefixed value.

This decrease in output causes an increased current flow in the LH side of TR8, because the base potential of the RH side of TR8 decreases with the output and at the same time the base voltage of the LH side becomes.reduced of a smaller value because of the divider drain. This gives a voltage current characteristic equivalent to that shown in Fig. 2.6.

The max value that the current can reach is set by pot RV6.

Capacitor C23 is a noise filtering element for the differential amplifier inputs.

2.4.3. - Fast voltage protection

The fast voltage protection circuit short-circuits the Power Supply output, in 20 to 30 usecs, when the voltage out goes beyond a prefixed value.

Figure. 2.23. shows a simplified schematic of the fast voltage protection circuit.

The circuit is composed of:

a - A comparator (TR10). Used to compare a portion of the output voltage with a reference.

b - A discriminator (TR11). The unijunction transistor triggers when the threshold level is beyond a given level.

c - Diode switch (D73). Used to short-circuit the output when diode gate level is reached.

A constant +5.6 V, derived from Zener D68 and resistor R41, is applied to one input of the comparator circuit. The other comparator input receives the output voltage through a potential divider chain made up by R36 and R37.

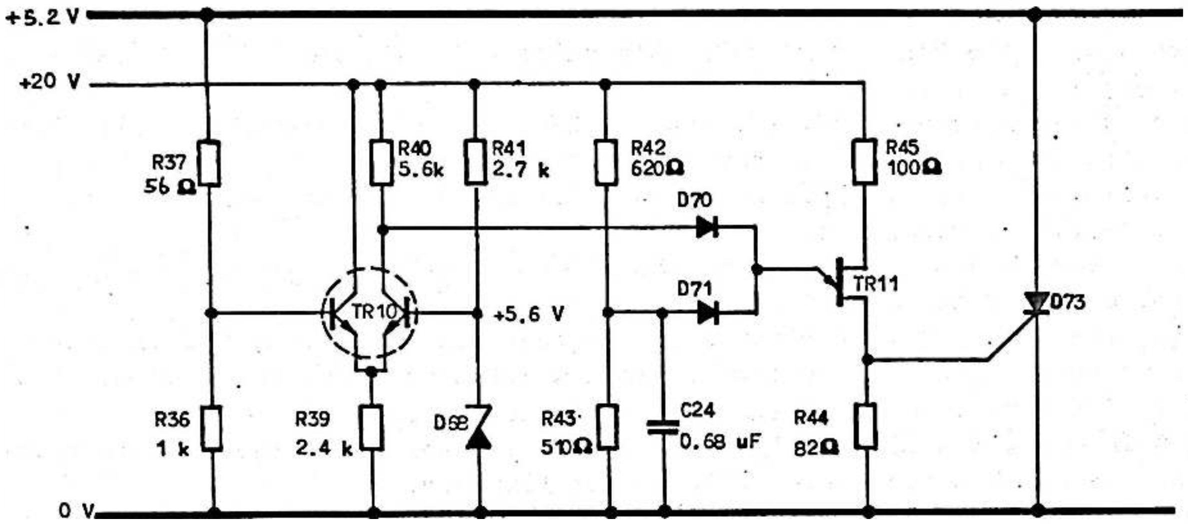


Fig. 2.23. - Fast voltage protection circuit

As long as the output does not exceed +6V, the LH side transistor of TR10 remains cut off and the RH one will conduct steadily. This condition is given because the LH base is more negative than the RH one.
Under these conditions, the RH side collector voltage of transistor TR10 is less than the threshold level of the unijunction transistor which, being in the cut off condition, does not supply commands to the controlled diode D73.
When the output voltage goes beyond +6 V, the divider tied to the base of the LH of transistor TR10, biases the said base with a voltage level greater than that present on the base of the RH transistor. The left transistor conducts and the right transistor cuts off.
As a result, the collector voltage of the RH transistor increases. When the threshold level of unijunotion transistor TR11 is reached the unijunction turns on through diode D70. The turning on of TR11 sends a command pulse utilizing the voltage drop across R44, to the gate of controlled diode D73.
The conducting SCR short-circuits the Power Supply output and remains in this condition until power is removed.
Capacitor C24 is charged through divider R42, R43 to a value under the cut on level of TR11 to ensure that, under normal conditions, its oharge does not influence the unijunction TR11.
In the event that the output voltage level rises in excess of the imposed limits and TR11 turns on, through diode D70, the unijunction is momentarily kept in conduction by the discharge of C24 through D71 because the hold-on voltage is inferior to the voltage level required to turn it on. This discharge of C24 is necessary to obtain an emitter current of TR11 sufficient to ensure the conduction of the SCR.

This arrangement has been chosen because if the capacitor had been parallel connected directly to the command circuit of TR11, it would have induced a deLay. Instead, with the described connection, the two circuits are effectively in OR and do not influence each other.
The current circulating in the SCR is very high at the onset of conduction because it must discharge the filter capacitance but it soon settles down to the current limiting circuit level until the slow protection circuit(ALI 030) comes-in, in about 50 msecs.

2.4.4. - Phase loss protection

The Power Supply output can also be cut if a phase should fall. See figure 2.24.
The circuit that caters for such events utilizes a 3 phase half wave rectifier unsmoothed, a level discriminator and a controlled diode in parallel to the overload circuits.

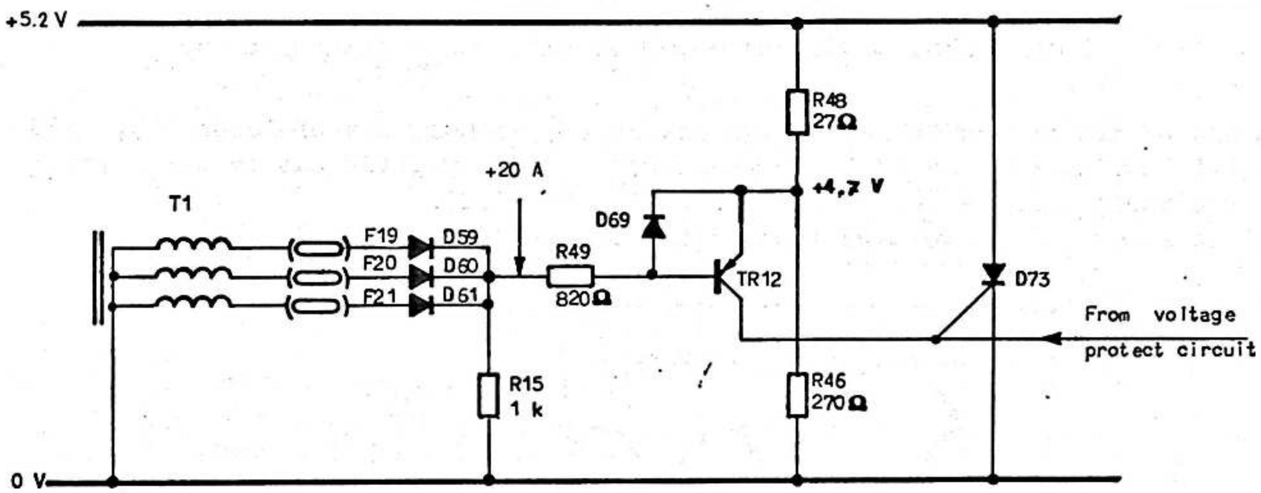


Fig. 2.24. - Phase loss protection schematic

The output of the rectifier, when all 3 phases are present, (signal +20 A)is shown in Fig. 2.25. Notice that the instantaneous value of the +20 A never goes under +10 V.

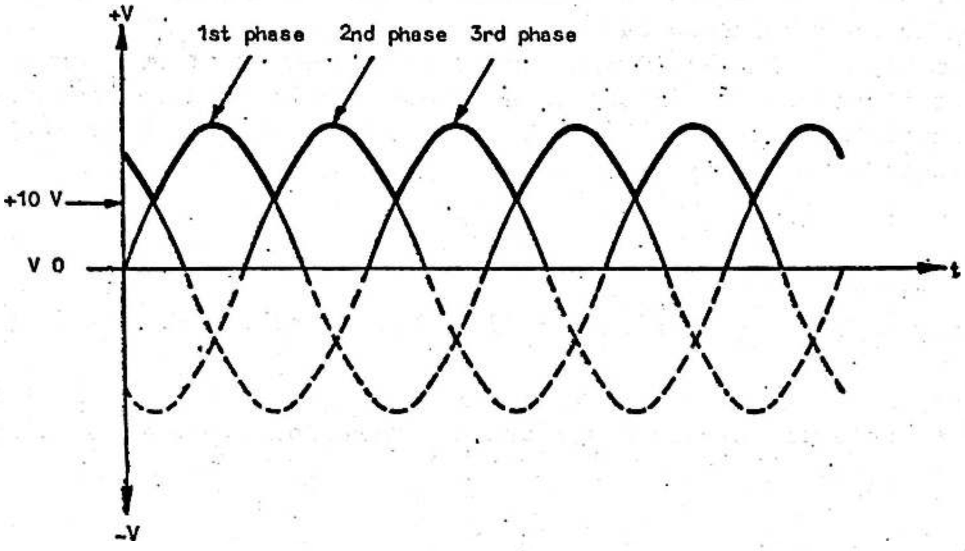


Fig. 2.25. – Signal + 20 A with all phases present

In one of the phases falls through any cause, such as one of fuses F19, F20 or F21 blowing or a mains phase missing, the supply given out by the rectifier circuit will be modified as shown in Fig. 2.26.
Notice now that the voltage goes right down to the 0 V level.

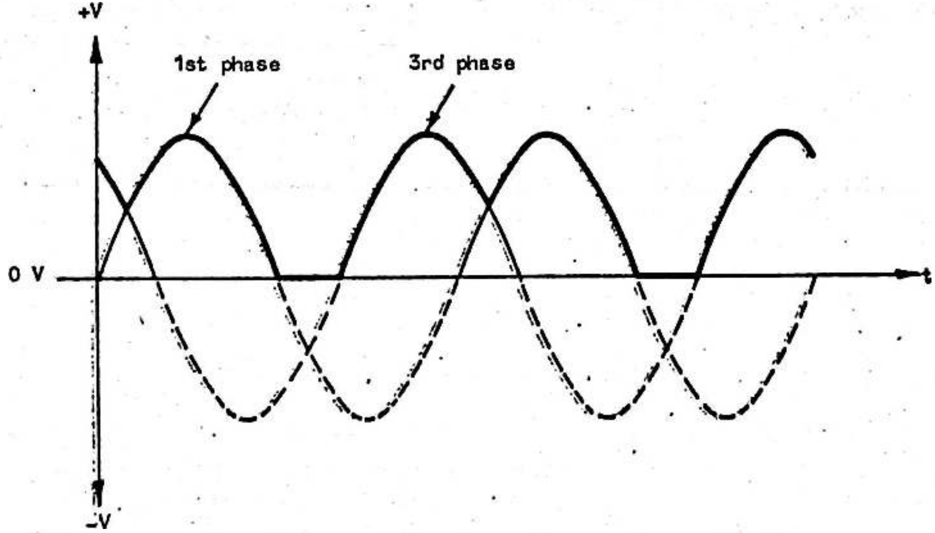


Fig. 2.26. – Signal + 20 A with one phase missing

Level discrimination is done by transistor TR12. As long as all the phases are present, TR12 has +4.5 V on its emitter, given by divider R46 and R48.
As long as signal +20 A is above +4.5 V, the b-e junction of TR12 has reverse bias on it holding it cut off.
When signal +20 A goes under +4.7 V because one phase is missing, the b-e junction of TR12 is directly biased for a period of time (see Fig. 2.26.) causing the transistor cut on. Current flows in the gate circuit of D73 and it turns this diode on.
Diode D69 limits the inverse current on b-e junction of TR12.

2.4.5. - Services supplies

Each current and voltage regulator circuit has its supplies generated by 4 rectifier circuits which supply +6 V, -6 V, +32 V and -16 V.
These secondary supplies, from now on termed Services, have their 0 V tied to the positive side of the output.

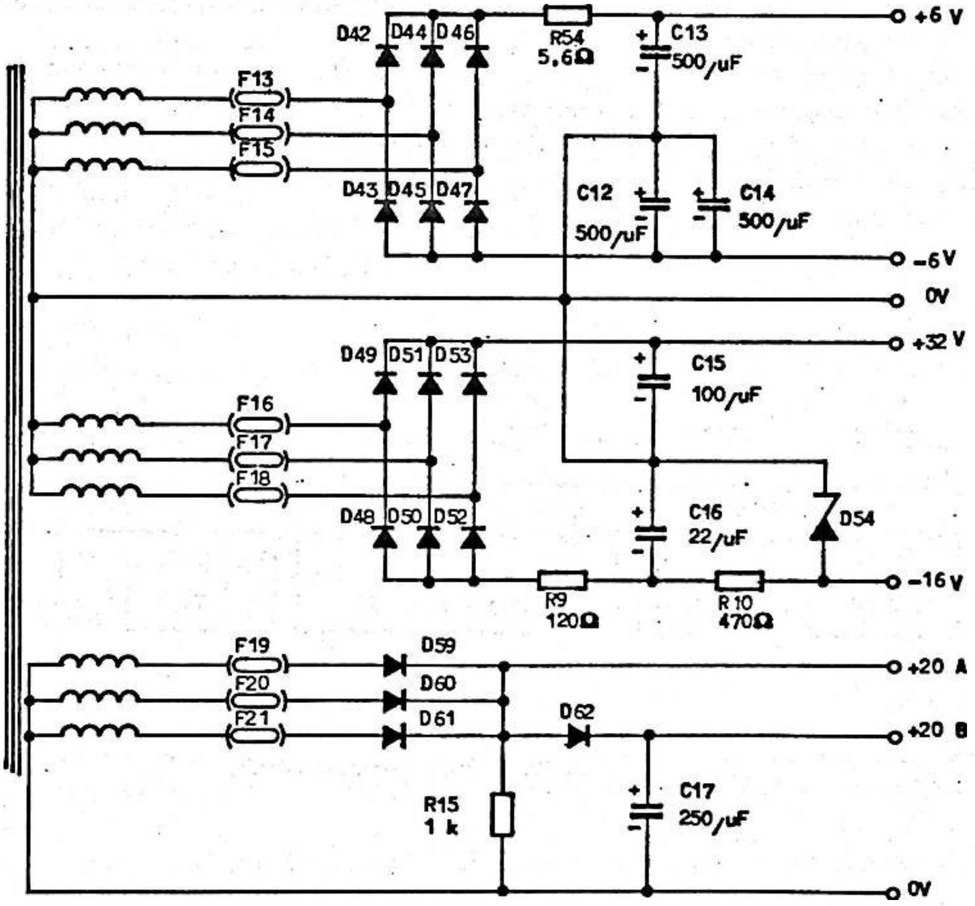


Fig. 2.27. - Simplified Services circuit diagram

The fast voltage protection circuit is supplied by +20 V (termed +20 B), obtained from the +20 A (see Phase Loss), through isolating diode D62. Capacitor C17 charges up to +20 V, so that if there is a phase loss and the +20 A falls, the supply is maintanied for the required time to allow the slow protection circuits to intervene.
The zero of the +20 A and +20 B is tied to the negative side of the output.
If a maximum of 2 out of the 3 fuses (F13, F14, F15) used for the +6 and -6 V go in open circuit, the result could be an increase in the ripple value of the Services voltages with a proportional increase of ripple on the supplied voltages.

2.4.6. - Thermal protection circuits

Six components housed within the ALI 150 Power Supply are directly protected against overheating by thermoswitches.
The interested components are:

- the two main transformers each of which has 3 thermoswitches series connected and physically connected on the 3 primary windings. The thermoswitches operate at temperatures above 135°C,
- the four switching transistors each with one thermoswitch fitted to the heat sink. The thermoswitches operate at temperatures above 75°C.

The opening of any of the 6 thermoswitches causes main breaker TL1 to de-energize and two lamps to light. One is mounted on the ALI 150 the other on the command panel of the ALI 030.

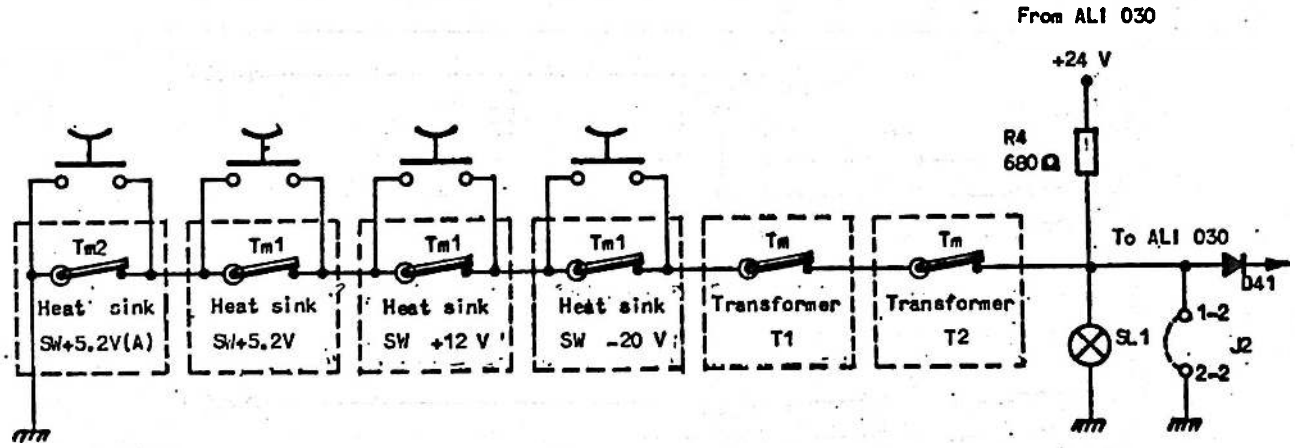


Fig. 2.28. - Thermoswitches

The lamp on the ALI 150 remains on only for the period in which the one or more thermoswitches remain open.
The lamp on the ALI 030 once the any thermoswitch has opened and again closed, remains on until AC switch-off.
To ease the identification of which particular termoswitch has tripped, a set of pushbuttons is provided to locate it.
Pressure on the buttons, being them in parallel to the thermoswitches, puts an open switch in short circuit and extinguishes lamp SL1. If the open thermoswitches are more than one, it will be necessary to press all the buttons simultaneously, then release them one at the time, keeping pressed those that keep SL1 lit.
If after all 4 pushbuttons have been depressed simultaneously SL1 has not gone out, it means that the thermoswitches on T1 or T2 are open.
If it becomes necessary to utilize the Power Supply with one or more thermoswitches open for troubleshooting purposes, the overtemperature signal will have to be grounded to enable breaker TL1.
Ground points 1-2 with 2-2 of J2 connector.

2.4.7. - Slow voltage protection circuit

The main Power Supply breaker TL1 will de-energize for an output swing greater than 8%, plus or minus, from the nominal value.
The circuit that absolves such function is termed the slow voltage protection circuit because it employs about 50 msec to trip off the main breaker.
The protection device is composed of two assemblies:

- one, located in the ALI 150, sens levels in excess of ± 8%,
- the other, fitted to the ALI 030, receives indications from the ALI 150 to de-energize TL1.

Each voltage to be protected has two similar circuits. Their outputs are ORed and act when:

- the voltage goes beyond the nominal 8% (one circuit),
- the voltage is inferior to the nominal 8% (the other circuit).

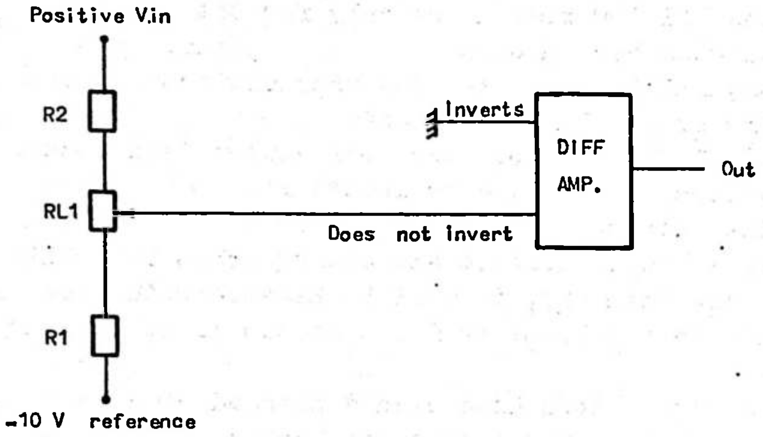
To check the levels reached by the voltage a resistive divider network is utilized feeding a comparator.
The voltage divider receives:

- the voltage level to be protected is fed to one side,
- a reference 10 V, of sign opposite to that of the output voltage, on the other side.

The voltage divider gives out:

- from a center resistive tap, a voltage of about 0 V. The tap varies depending on the value of the voltage to be protected and as per the divider ratio.

The comparator is a differential amplifier that compares the divider 0 V with a fixed reference 0 V.



(The sign is opposite to that of voltage to be protected)

Fig. 2.29. – Simplified + 8% swing protection circuit

The differential amplifier utilizes integrated circuits. It has two inputs and only one output giving out the amplified version of the difference between the two inputs.

The level of output ranges from about 0 V to +6 V. The two inputs are termed:
- non-inverting input,
- inverting input.

The name given to the two inputs is referred to the relationship between input and output phase or, in other words:
- the inverting input goes to a higher voltage level than the non-inverting input if the output is low (0 V).
- the non-inverting input goes higher than the inverting input if the output is high (+6 V).

Because the output voltage can only swing from about 0 V to about +6 V and because of the high gain of the amplifier (about 1500), a potential difference between the two inputs of only a few millivolts is sufficient to have the output either completely high or completely low.

The differential amplifier is thus employed as a level discriminator with ON-OFF output for very small input variations.

a – +8% protection. See Fig. 2.30.

Under nominal working conditions, a voltage slightly more negative than 0 V is drawn at pot RV1 and applied to the non-inverting input so to have the inverting input positive with respect to the other input and the output low.

When the voltage to be protected increases, the voltage at the non-inverting input also increase by a quantity set by the divider value. When the non-inverting input value goes beyond the 0 V by a few millivolts with respect to the inverting input, the amplifier output goes to +6 V sending a command to disable the hold-on circuits for the TL1 main breaker.

b - -8% protection. See Fig. 2.30.

To implement this sort of protection, a sligtly positive voltage, with respect to the 0 V, is drawn from the divider at RV2 pot position.
This proportional value is applied through the inverting input to the differential amplifier, so that the inverting input is positive with respect to the other input and with the output low.
When the voltage to be protected decreases, the inverting input voltage also decreases by a certain value,becoming a few millivolts less than the non-inverting input.
The amplifier output thus goes to +6 V sending a disabling command to the TL1 hold-on circuits.

The amplifier output utilized to perform the +8% protection is ORed with the output used for the -8% protection. The two amplifiers are housed in the same can.

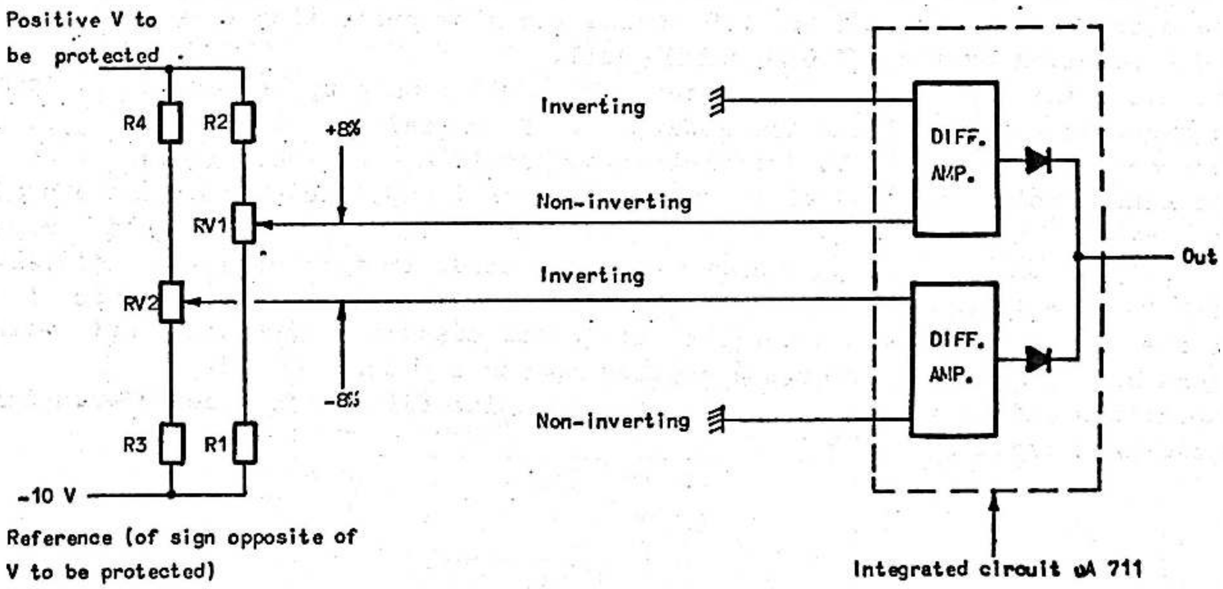

Positive V to be protected
R4
R2
+8%
RV1
RV2
-8%
R3
R1
-10 V
Reference (of sign opposite of V to be protected)
Inverting
Non-inverting
Inverting
Non-inverting
DIFF. AMP.
DIFF. AMP.
Out
Integrated circuit µA 711

Fig. 2.30. - Schematic ± 8% single output protection

If the voltage to be protected is of negative sign, the +8% protection is obtained by putting the signal on the inverting input, while the -8% is obtained by feeding the signal to the non-inverting input.

The -24 V and the -10 V, generated and stabilized by the ALI 030, are dropped down to +12 V and -6 V respectively, by two Zener diodes, to supply the two differential amplifiers.

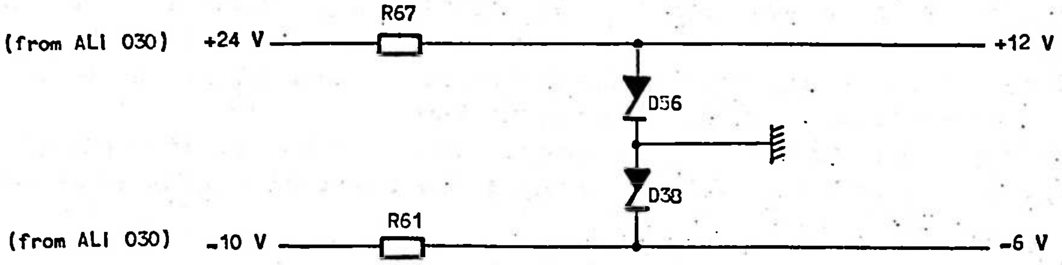


Fig. 2.31. - Circuit to realize + 12 V and - 6 V

Figure 2.32 shows the complete schematic circuit dealing with the slow voltage protection for the +5.2V +12 V and -20 V outputs.
The circuit utilizing R68 and R69 causes the slow protection to act if the -10 V, supplied by the ALI 030, should fall.
With both the +12 V and -6 V present, the divider made up by R68 and R69 puts on the anode of diode D39 about 0 V. If instead the -10 V fails, and consequently the -6 V, the divider output is a positive voltage.
The Zener diodes in parallel to the differential amplifiers inputs, are used to equalize the potential difference between the inputs, which could rise sensibly if one power supply becomes disconnected. In this case the divider only remains tied to the reference voltage and it is this value that is fed to the input used at the time. The integrated circuit uA 711 would not withstand such a voltage difference applied to its inputs.
Capacitors and resistors on the inputs are noise filters for the differential amplifiers inputs.

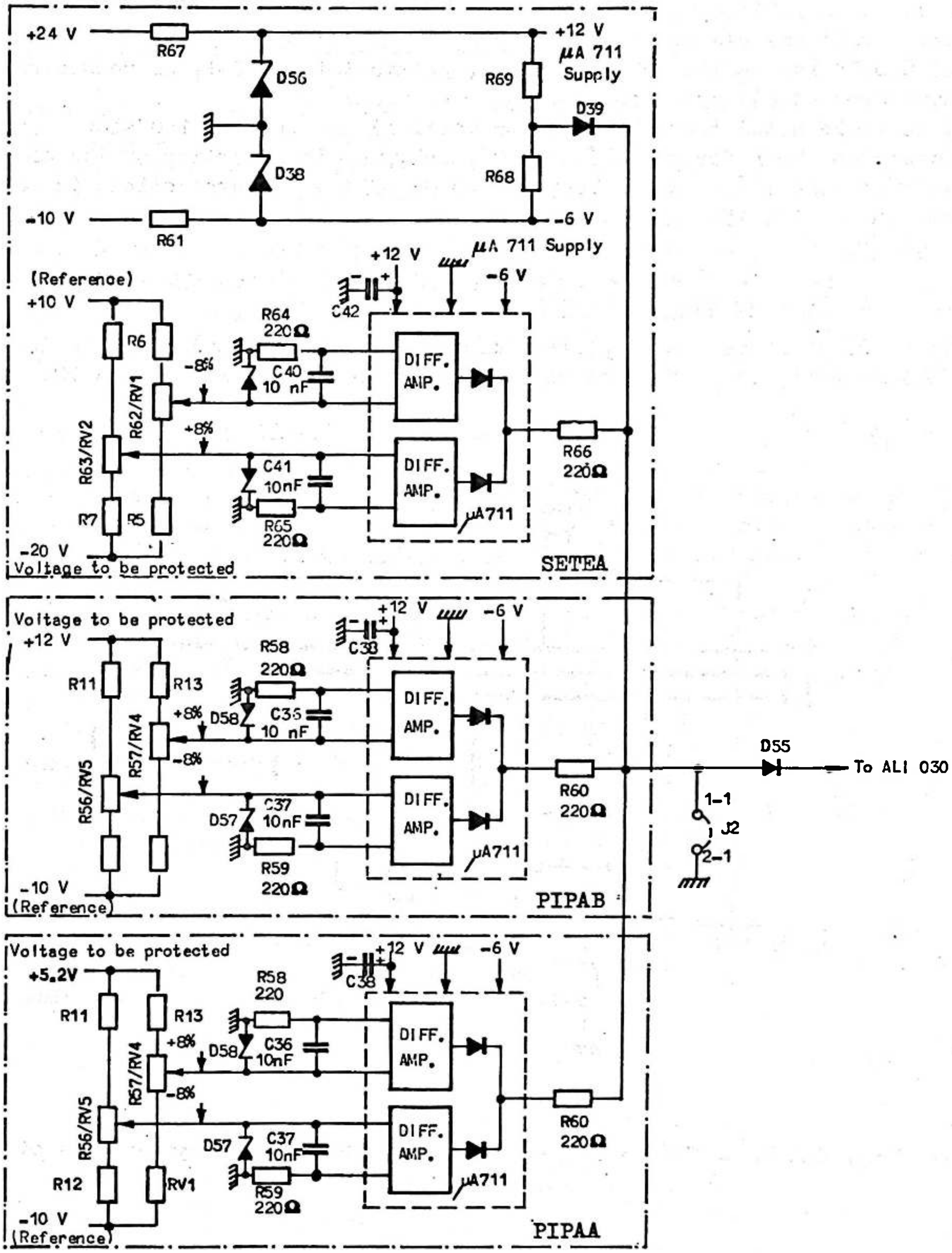


Fig. 2.32. – Simplified diagram for slow voltage protection

Whenever it becomes necessary to short to ground the signal sent to the ALI 030 to remove the hold-on on TL1, points 1-1 and 2-1, of connector J2, may be connected together.
It is to be noted that the circuits utilized for the ALI 150 slow voltage protection, both for the +8% and -8%, only use that portion of the ALI 030 relative to the +8%. This is because the OR of the two protections is already done in the ALI 150.

2.4.8. - AC power supply circuits

Figure 2.33. shows the simplified diagram of those circuits within the ALI 150 that are used to forward the AC supply to transformer T1 and T2.

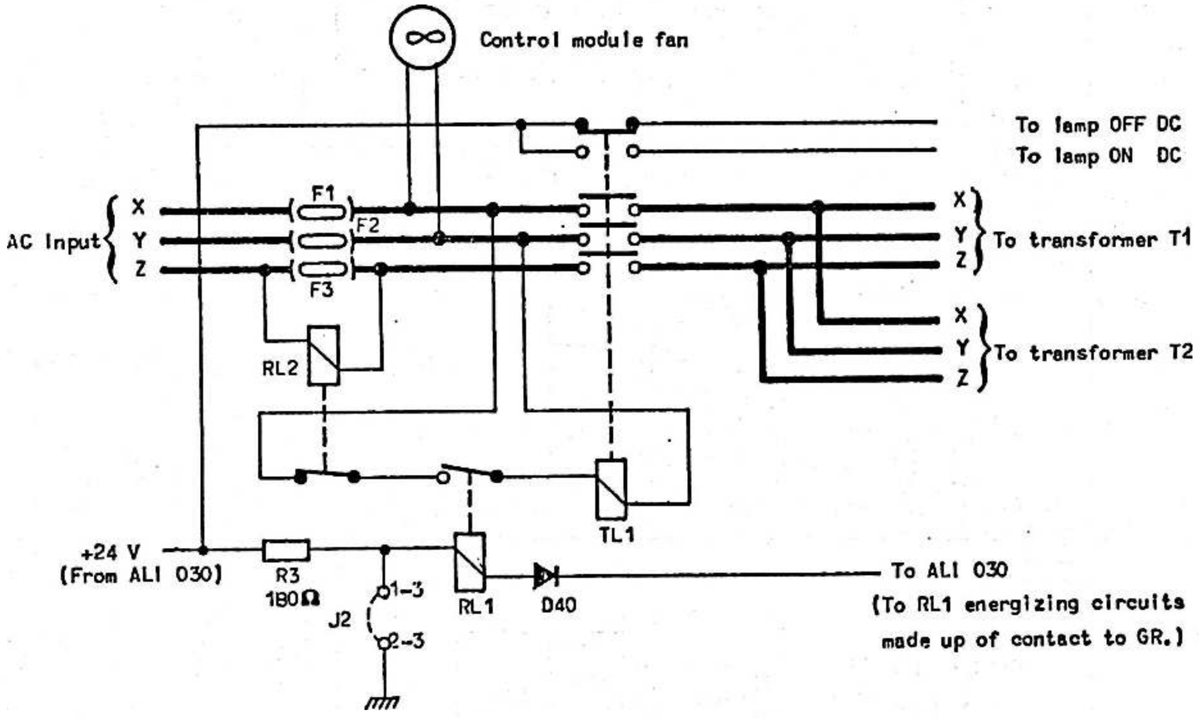


Fig. 2.33. - Transformers T1 and T2 AC supply through circuit

To supply power to T1 and T2 transformers, it is necessary that the main TL1 breaker be energized, which is conditioned by the energized state of RL1 and not by RL2.
The purpose of RL2 is that to prevent TL1 energizing : F3 has blown. TL1 cannot energize if fuses F1 and F2 are interrupted.
Relay RL1 is energized by +24 VDC, on one side, fed through resistor R3 from the ALI 030. Path is made through a series of relays and contacts to ground located either in the ALI 030 or in the operator's console.
The AC power supply to the ALI 150 may be isolated by preventing the energizing of RL1, by grounding the +24 V at R3. This is realized by linking points 1-3 and 2-3 of connector J2. In these conditions, diode D40 prevents RL1 energizing through the action of possible return currents from the ALI 030.

2.4.9. - External load removal from a voltage

Every voltage output of the ALI 150 must have a minimum external load to enable the Power Supply to generate at least 1/10 of the max current output. If it becomes necessary to have the P.S. function with one or more voltages in the off-load conditions, it is always required to have a minimum load on the voltage under exam.
To permit operation under the above conditions, four switches are supplied. They are fitted on the front of the adjust panel and through them the following loads may be switched:
- external, in position 1-3,
- internal, in position 1-2. The load here is 1/5 of max. See Fig. 2.8.

When operating on the +5.2V, it is necessary to switch to the interested position both the main (S2) and the augment (S1) chassis.
When utilizing internal loads, the slow voltage protection must be isolated, by linking points 1-1 and 2-1 of connector J2. See Fig. 2.32.

3. ALI 031-032 SCR POWER SUPPLY

3.1. - SCR PRINCIPLE OF OPERATION

The control circuit of an SCR Power Supply is realized with silicon controlled rectifiers.
Control is achieved by varying, as required, the conduction curve of the SCR in relationship to the AC voltage supply.
The principle of utilization of an SCR in a circuit, is shown diagramatically in Fig. 3.1.

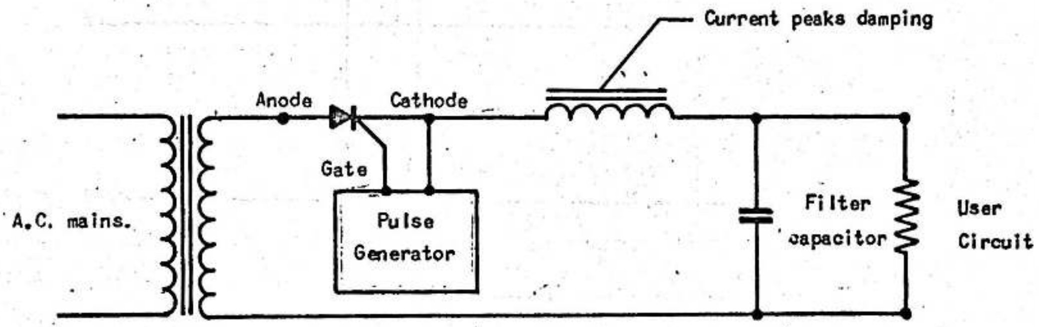


Fig. 3.1. - Utilization of an SCR

During the half-waves that negatively bias the anode with respect to the cathode, the SCR is inversely biased and thus emitting no current.
During the half-waves that positively bias the anode with respect to the cathode, the SCR is polarized in the forward sense but can be passed by direct current if commanded by a positive going pulse applied between gate and cathode.
After the SCR has begun to conduct direct current between cathode and anode, the drive pulse can be discontinued because the SCR once triggered remains in conduction. It remains in conduction as long as the cathode is kept negative with respect to the anode.

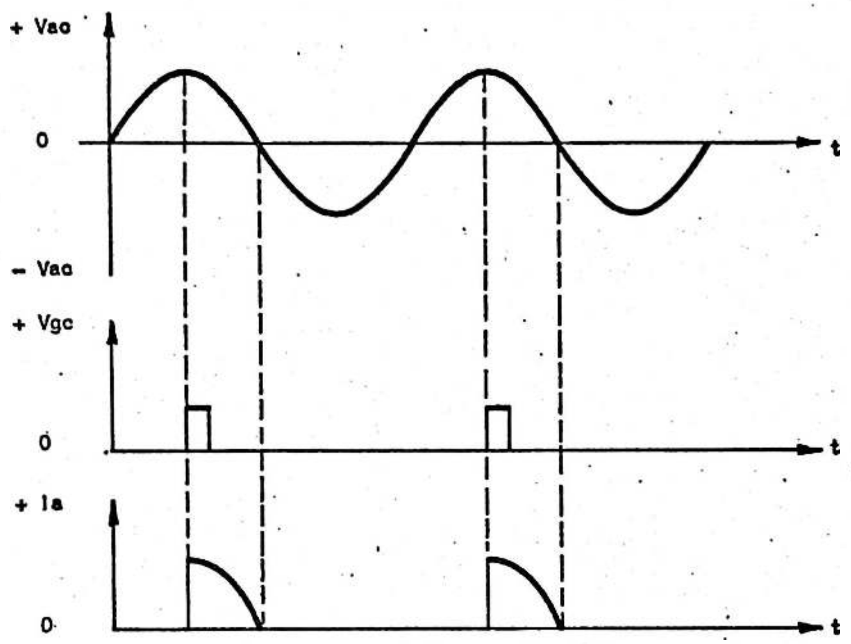


Fig. 3.2. – Anode current Ia for gate potential Vgc

The output pulses of the SCR are utilized to charge up a capacitor which discharges into the user circuit small value pulses between one half-wave and the next. The capacitor charges through on inductance to smooth as much as possible the charge current during the SCR conduction period. Without this coil, the initial charge current would reach very high values and go to zero when the capacitor had reached the charge voltage peak value.

To the purpose of keeping the filter capacitor value within convenient limits, and at the same time considering the current absorbed and the maximum change value of the output voltage between charges and discharges of the capacitor itself, a 6 phase charge circuit is utilized instead of a single phase circuit as illustrated in Fig. 3.1.

The 6 phases are obtained by feeding the 3 phase AC supply to a particular transformer having a double secondary winding.

3.2. - SCR POWER SUPPLY OPERATION

To obtain a stabilized output voltage from an SCR type Power Supply, the following operations are carried out:

- A portion of the output voltage is compared with a constant reference voltage. The result of this comparison shall be termed "error voltage".
- The error voltage is amplified and after the amplification is allowed to vary between +6.5 V and +20 V.
- A mains sinusoidal signal is summed to the amplified error voltage with a 90° lead with respect to the anode voltage of the SCR that is to be driven.
- When the trailing edge of the sinusoidal signal goes through zero, a gated oscillator issues a drive pulse for the SCR.
- A capacitor is charged through a coil by the SCR to obtain an output voltage.

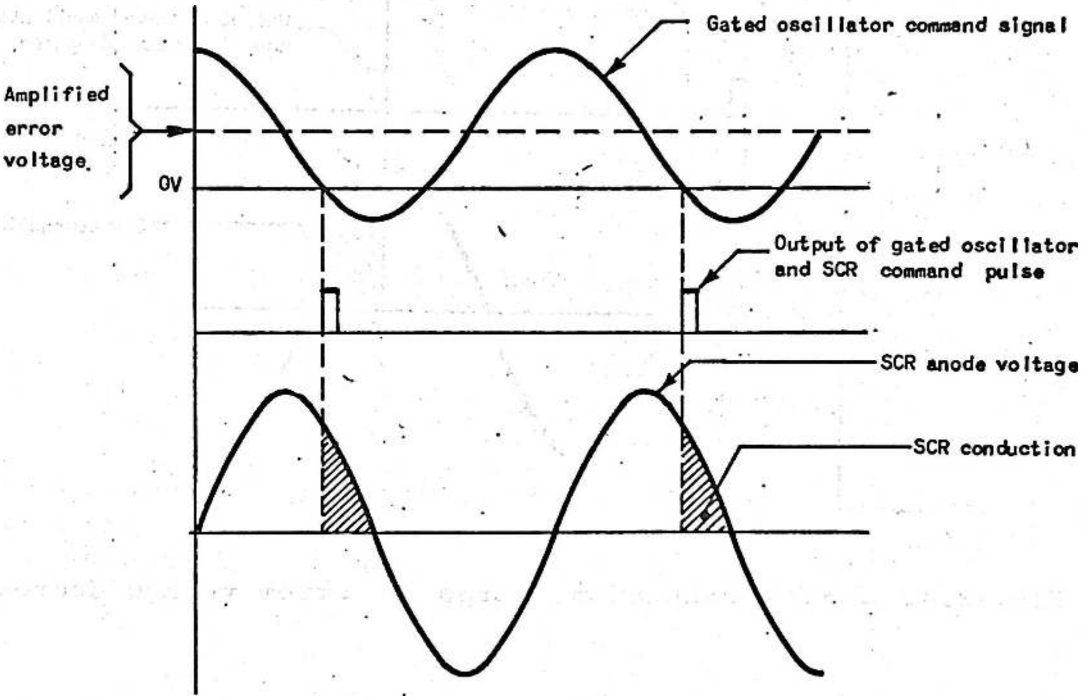

Gated oscillator command signal
Amplified error voltage
0V
Output of gated oscillator and SCR command pulse
SCR anode voltage
SCR conduction

Fig. 3.3. - SCR switching method

A decrease in the output voltage induces a proportional decrease in the amplified error voltage which is the carrier of the sinusoidal signal used to switch the gated oscillator. This decrease in the error voltage causes the oscillator to switch, thus driving the SCR into conduction, in advance with respect to the example shown in Fig. 3.3. See Fig. 3.4.

The earlier cut on of the SCR permits the use of a greater portion of the supply voltage than that utilized during steady state conditions. This increases the output level and brings it in within nominal parameters.

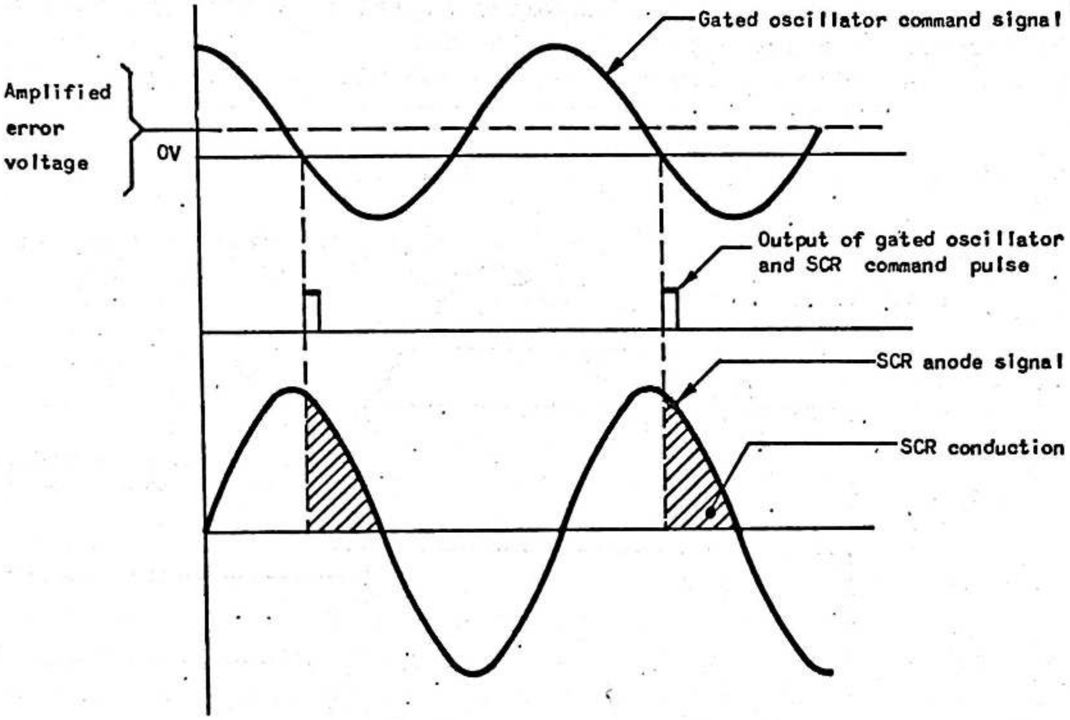

Gated oscillator command signal
Amplified error voltage
OV
Output of gated oscillator and SCR command pulse
SCR anode signal
SCR conduction

Fig. 3.4. – SCR conduction charge for error voltage decrease

If the output voltage increases, the error voltage also increases and the SCR cut-on is delayed as shows in Fig. 3.5.

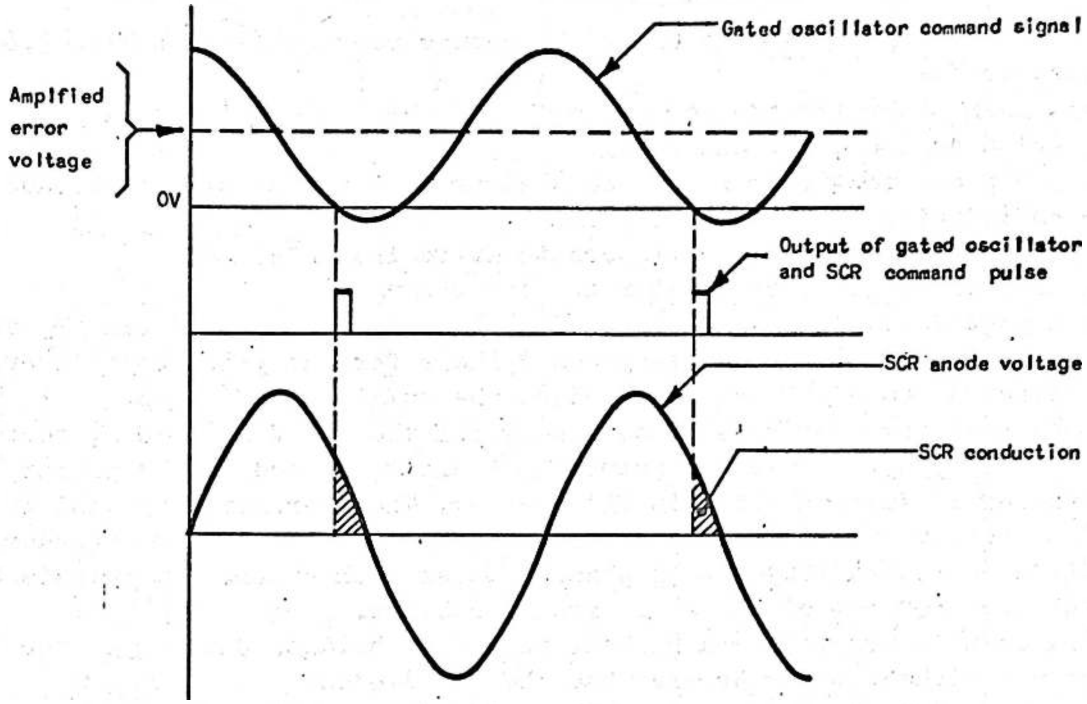

Gated oscillator command signal
Amplified error voltage
OV
Output of gated oscillator and SCR command pulse
SCR anode voltage
SCR conduction

Fig. 3.5. - SCR conduction change for error voltage increase

Utilizing the range of variations that the error voltage can assume, it is possible to vary the conduction point of the SCR between 110° and 170° of the SCR anode current.

3.3. - BLOCK SCHEMATIC

The Power Supply is made up of the groups representend in Fig. 3.6. and listed here below:

- A main power transformer T1, with a 3 phase star connected primary and two delta connected secondaries.
- A 6 phase rectifier bridge consisting of 6 normal silicon diodes and 6 SCRs.
- An inductance-capacitor filter.
- A group of 6 gated oscillators to drive the SCRs.
- An error voltage comparator and amplifier.
- A second transformer T2, with a 3 phase star connected primary and two star connected secondaries, one 6 phase for the gated oscillators and the other 3 phase utilized to produce the auxiliary voltages.
- An auxiliary voltages power supply for the +20 V and -20 V, termed Services.

The AC supply, applied at points R, S and T, is fed to the primary main transformer T1 through the main TL1 breaker. The transformer output is 25.5 V RMS. Transformer T1 has the primary star connected and the two secondaries are delta connected 180° out of phase between each other. Six outputs are thus obtained 60° out of phase one from the other.

The outputs are fed to a 6 phase rectifier bridge. One leg of the bridge has normal diodes, the other leg has the SCR diodes.

Extra fast fuses (P1) protect the bridge components.

The cut-on of the SCRs is cyclically controlled by the gated oscillators. They are synchronized to the anode-cathode voltage of the SCRs through transformer T2, which has the primary and two star connected secondaries. The two secondaries are 180° out of phase between each other and have their star centers interconnected.

Six outputs are obtained with a 60° phase lead with respect to the previous vector and with a 90° lead upon the SCR anode voltage.

This last phase difference is obtained by the appropriate field coupling of main to secondary windings. This gives a phase lead, with respect to the power phase, of 90°.

The leading phase-shift of 90°, with which the gates oscillators are controlled, is used to determine the part of the sine-wave used by the SCRs, in output from T1.

Sync signals from T2 are superimposed to the amplified error voltage given out by the amplifier circuit.

The error voltage amplifier circuit has on its input the result of a comparison between a part of the output voltage and a reference voltage.

The amplified error voltage assumes a determined value when the Power Supply output is +20 V nominal.

If the output voltage tries to increase, the error voltage increases too with the consequent delay on the SCR conduction point. If the opposite condition occurs, the point of conduction is brought forward.

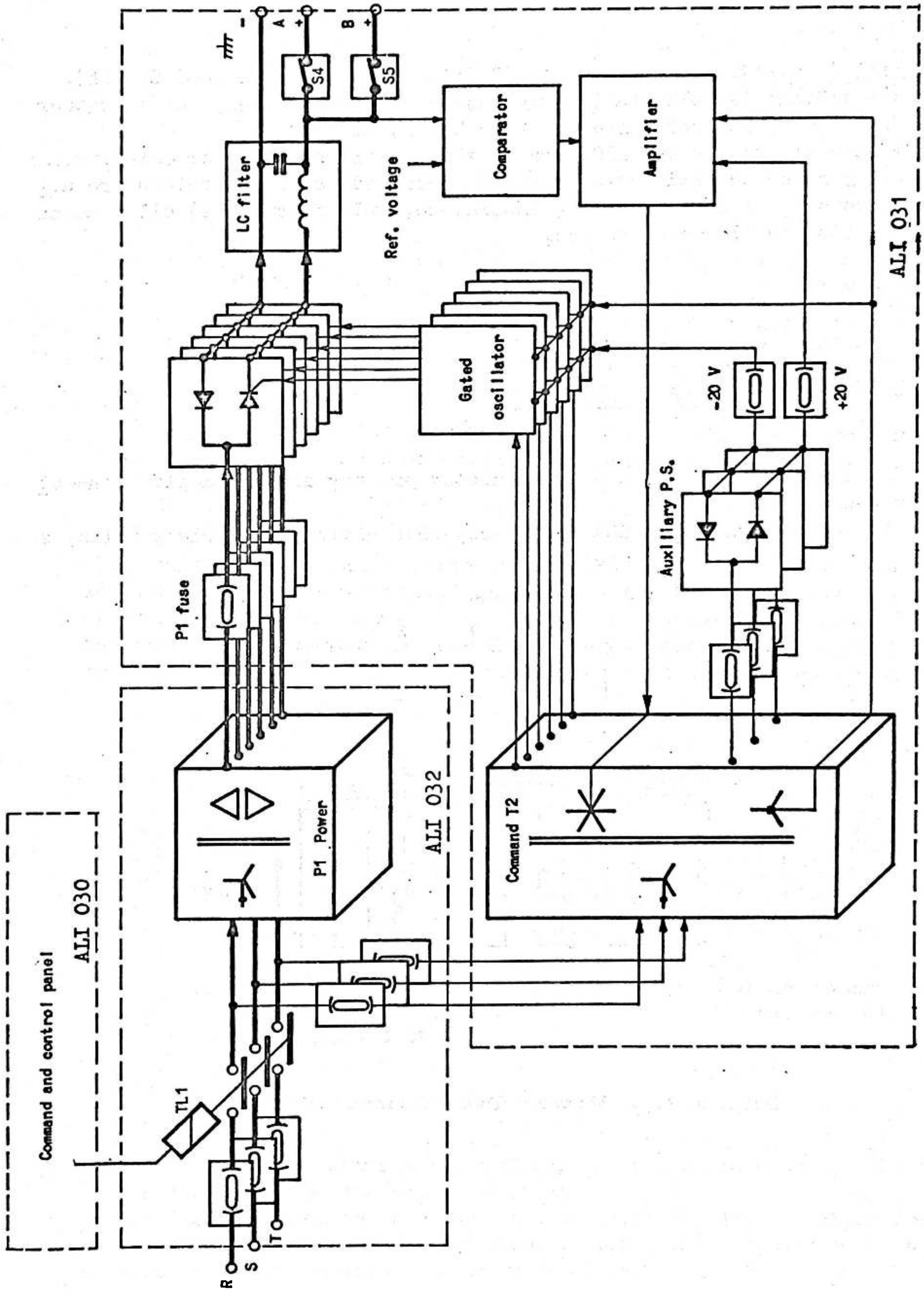


Fig. 3.6. - SCR Power Supply block schematic

The rectified voltage goes through an LC filter group (3.5 mH and 0.22 F). The output voltage is split in two branches each protected with a breaker against overloads and shortcircuits. (Breaker S4 and S5).
Services circuits of the ALI 030 furnish the command signals for main breaker TL1. Locally generated and operator panel generated commands devices are utilized to protect the Power Supply (temperature, voltage current) all of which go to act onto the TL1 main breaker.

3.4. - DESCRIPTION

3.4.1. - Power and command transformers

a - Main transformer.

The main transformer has a star connected primary and two delta connected secondaries.
The two secondaries are 180° antiphase, thus giving 6 secondary voltages each 60° out of phase to each other.

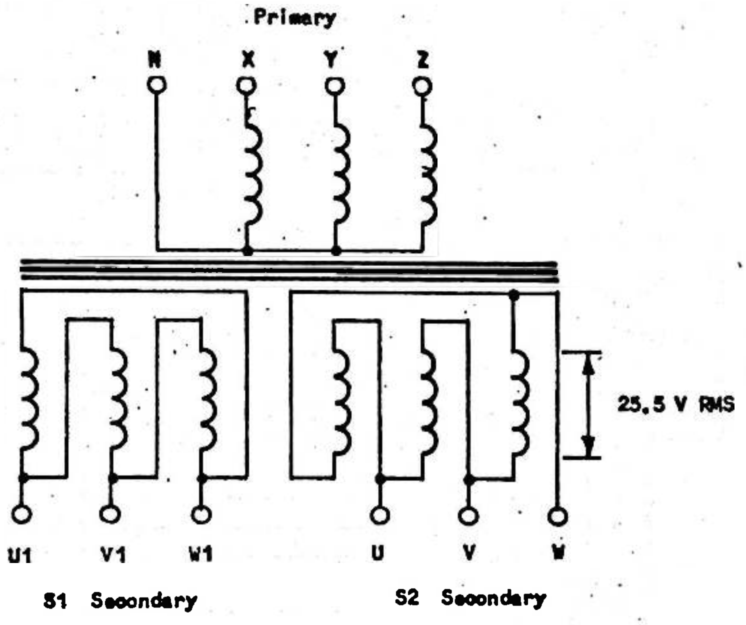


Fig. 3.7. - Power Transformer windings

The vectorial diagrams of Fig. 3.8., show the relationship between the primary voltage and the secondary voltages.

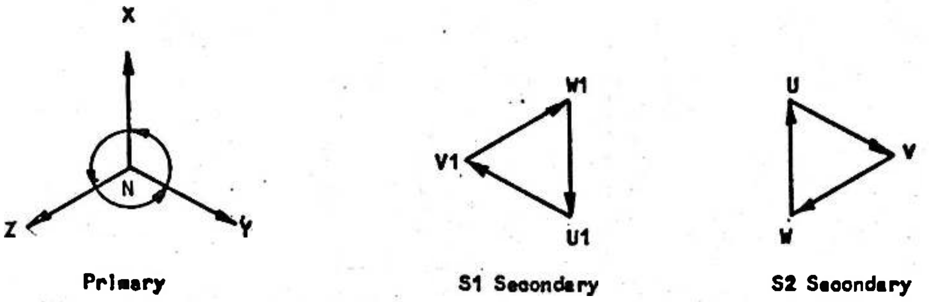


Fig. 3.8. - Primary and secondary voltages vector diagrams

The load is balanced on the two secondary windings; for this reason vector diagrams of the two secondary voltages can be drawn taking as reference an hypothetical star centre. The two secondary voltages can then be referred to this centre showing this out-of-phase with respect to the primary which is parallel connected to the main transformer primary.

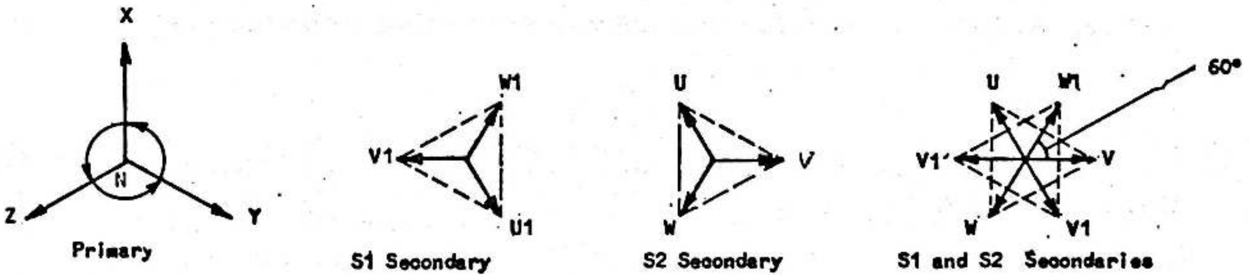


Fig. 3.9. - Vectorial diagrams of primary and secondary voltages referred to a hypothetical star centre.

b - Command transformer.

The command transformer has one primary and three secondaries. The primary and secondaries are star connected.
Two of the 3 secondaries are utilized to drive the gated oscillators and have a phase difference of 180° between each. Six secondary outputs are obtained each 60° out-of-phase to each other.

The third transformer secondary is utilized to generate the +20 V and -20 V Services supply voltages.

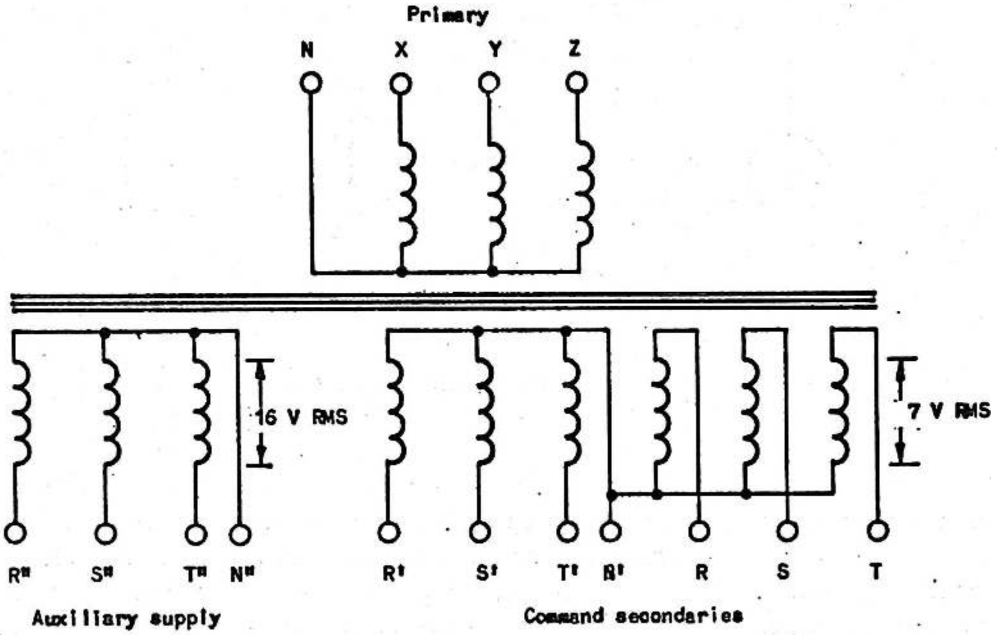
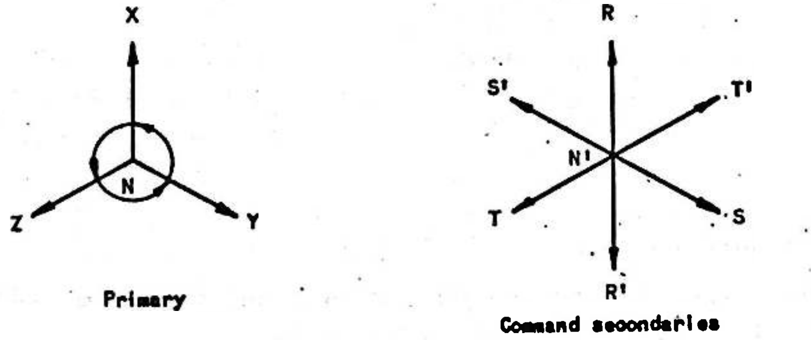


Fig. 3.10. - Command transformer winding connections

The vertical diagrams of the primary and secondary voltages are shown in the following drawing:



Primary

Command secondaries

Fig. 3.11. - Vectorial waveforms of command transformer primary and secondary voltages

Let us now consider the relationship between the command voltages and the power voltages in a general vector diagram.

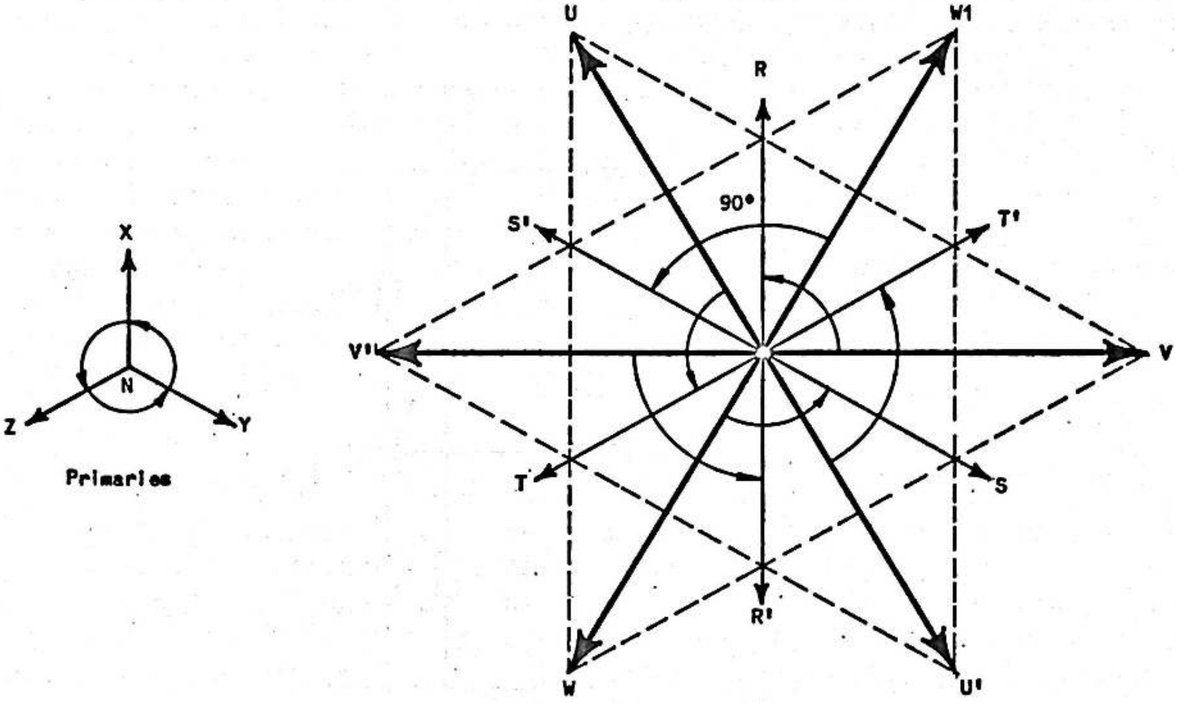


Fig. 3.12. - Power and command secondary voltages. General vector diagram

It can be observed from the general vector diagram shown in Fig. 3.12. that a phase difference with a 90° lead exists between a command phase and a power phase. This phase difference is necessary because of the characteristics of the circuits used to command the SCR on the trailing slop of the power sinusoidal.
The sequence XYZ must be adhered to respect functional specifications.

3.4.2. - Comparator

The comparator circuit shown in Fig. 3.13. is used to compare the constant voltage drop of 6.8 V, caused by Zener diode D6, with a portion of the output. This representative sample of the output is given by the divider network formed by R15, RV1, R9 and R16.

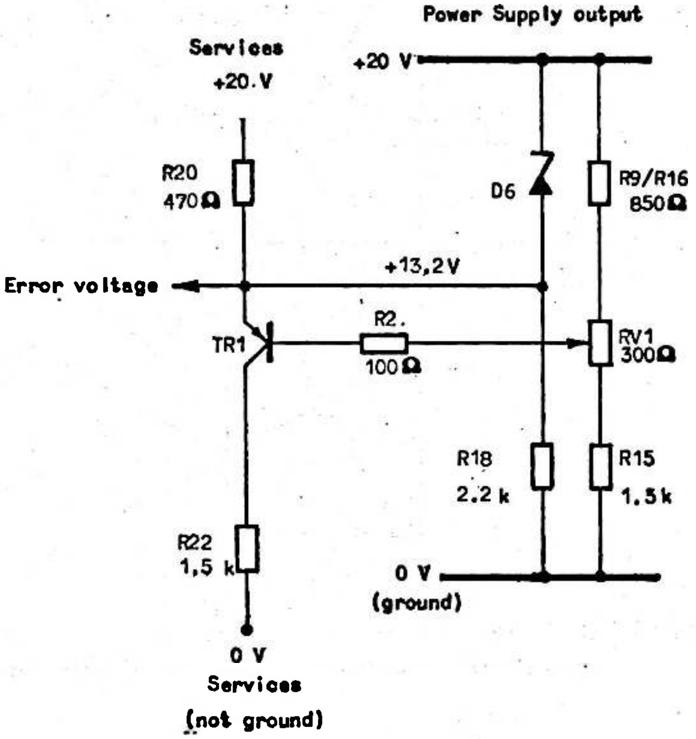


Fig. 3.13. - Comparator simplified circuit schematic

The comparison is done by applying the constant 6.8 V to the emitter of transistor TR1 and the output sample to the base.
Under nominal output conditions (+20 V), the base of TR1 is kept at a slightly negative voltage by means of RV1. This causes a given base and collector current on TR1. So, the error voltage takes on a determined value with respect to the Services 0 V.
It is to be noted that all Services voltages are isolated from ground. The only point that is common for the circuits supplied with Services voltages and the power circuits for the +20 V, is the emitter of TR1.
If the output voltage increases, the emitter voltage of TR1 increases by the same value, because the drop across the Zener is constant, while the base voltage only increases partially being it tied to the divider network.

In this case, the base potential becomes more negative, with respect to the emitter, with an increase in TR1 base and collector currents. This last condition causes the error voltage level to decrease, if compared to the Services 0 V.
If instead the output voltage decreases, the decrease in the emitter voltage is of the same value while the base voltage only goes down partially.
In this second case, the base voltage becomes less negative, with respect to the emitter, with a decrease in the base and collector currents of TR1. This causes an error voltage increase when compared to the Services 0 V.
So, it can be said that TR1 is utilized as a variable resistance device to set the error voltage value and:

- if output goes up, the transistor increases its own internal resistance and causes a lowering of the error voltage,
- if output goes down, the transistor increases its internal resistance causing the error voltage to go up.

3.4.3. - Error voltage amplifier

The error voltage amplifier receives on its input the voltage supplied by the comparator. The circuit amplifies and phase inverts the input.
If the error voltage increases, transistor TR2 does not conduct hard and only gives out a reduced voltage. If the error voltage instead decreases, the transistor goes in full conduction with an increase in the output voltage.

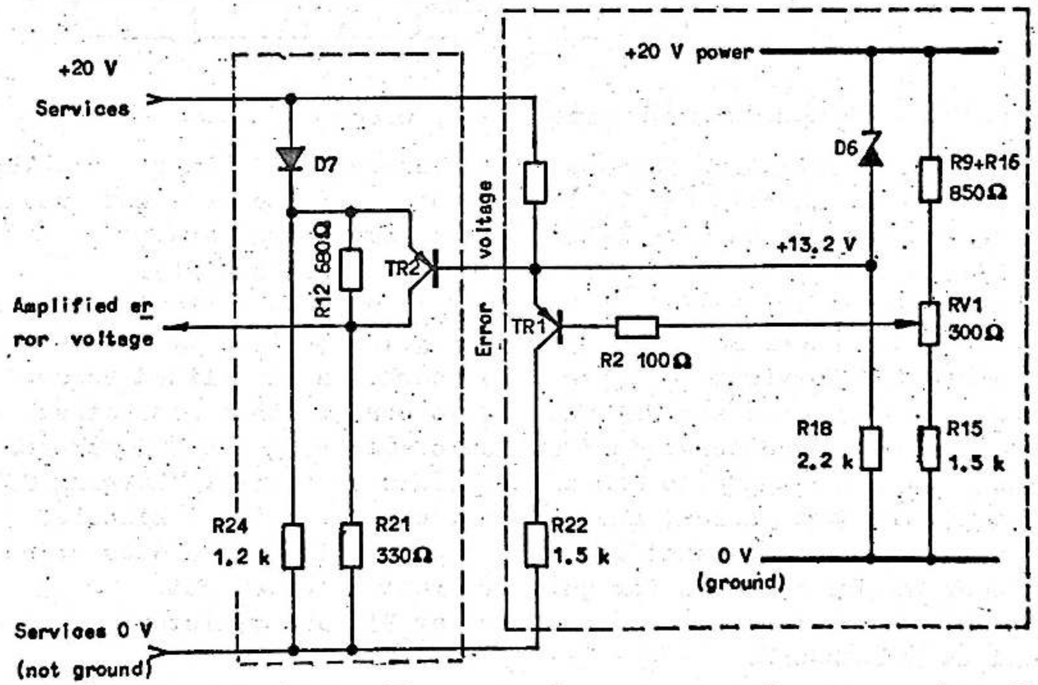


Fig. 3.14. - Error voltage amp and comparator tie-up

The output voltage is used as a carrier level for the gated oscillators drive pulses. The max value that such voltage can reach is about +20 V, or, more precisely, +20 V minus the 0.7 V drop across silicon diode D7, giving 19.3 V. The minimum value, obtained with TR2 cut-off, is +6.5 V, obtained through voltage divider R12 and R21.

Diode D7, supplied through R24, gives a threshold level to the input of TR2 to allow full cut-off conditions for TR2 when TR1 is blocked.

To stabilize the operation of the Power Supply, both the comparator circuit and the amplifier circuit have capacitor/resistor networks.

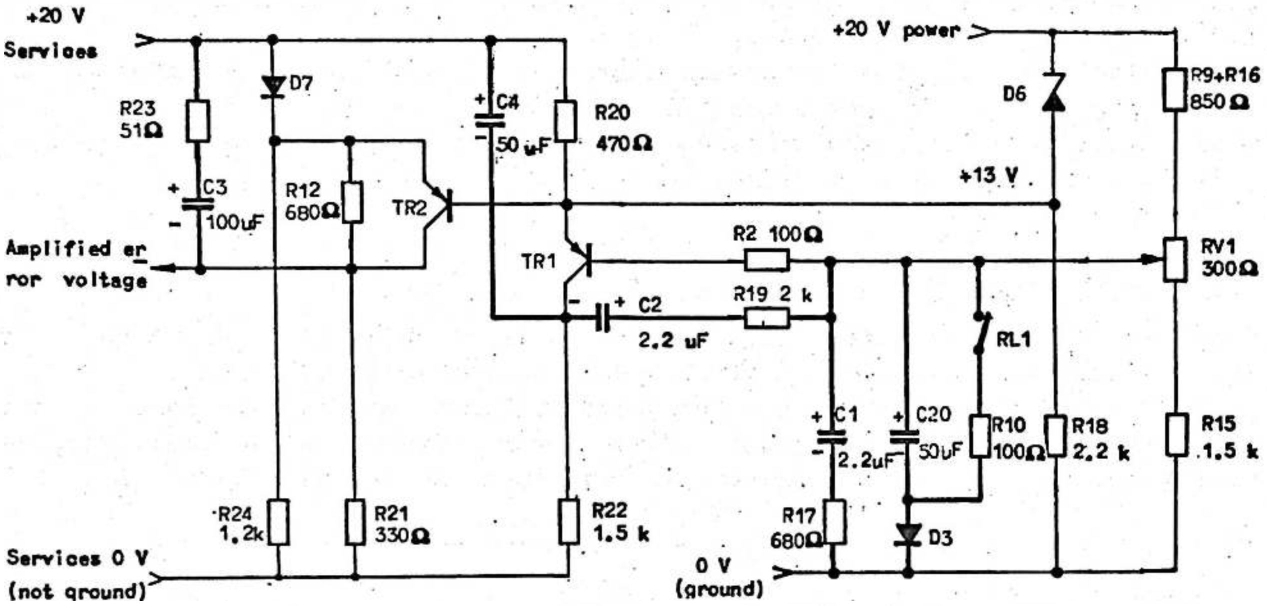


Fig. 3.15. – Amplifier and comparator circuit schematic

- C2 and R19 are to give negative feed-back to decrease the gain of TR1 with respect to the AC signals in. If these two components were not used, ripple would be considered as a variation on the output voltage.
- C4, C1 and R17 set the quantity of feed-back given by C2 and R19.
- C3 and R23 de-sensitize the output of TR2 to fast voltage variations.
- C20 is to prevent the Power Supply output from going to 24 V at the switch ON instant before the Services voltages have reached a stabilized value. The charge current of C20 causes TR1 and TR2 to conduct thus generating a high error voltage with the consequent effect of delaying the SCR cut-on.
- Diode D3 gives the charge path to C20 and prevents it from discharging. C20 charges up to max voltage present and does not condition input signals. Its discharge is prevented so that its high capacitative value does not reduce the Power Supply response for quick variations of output.
- To have C20 fully discharged at switch-ON, relay RL1 and resistor R10 put C20 to ground at switch-OFF.

3.4.4. - Sum of error voltage to command signal

The amplified error voltage is fed to the centre of the T2 command transformer star connected secondary.

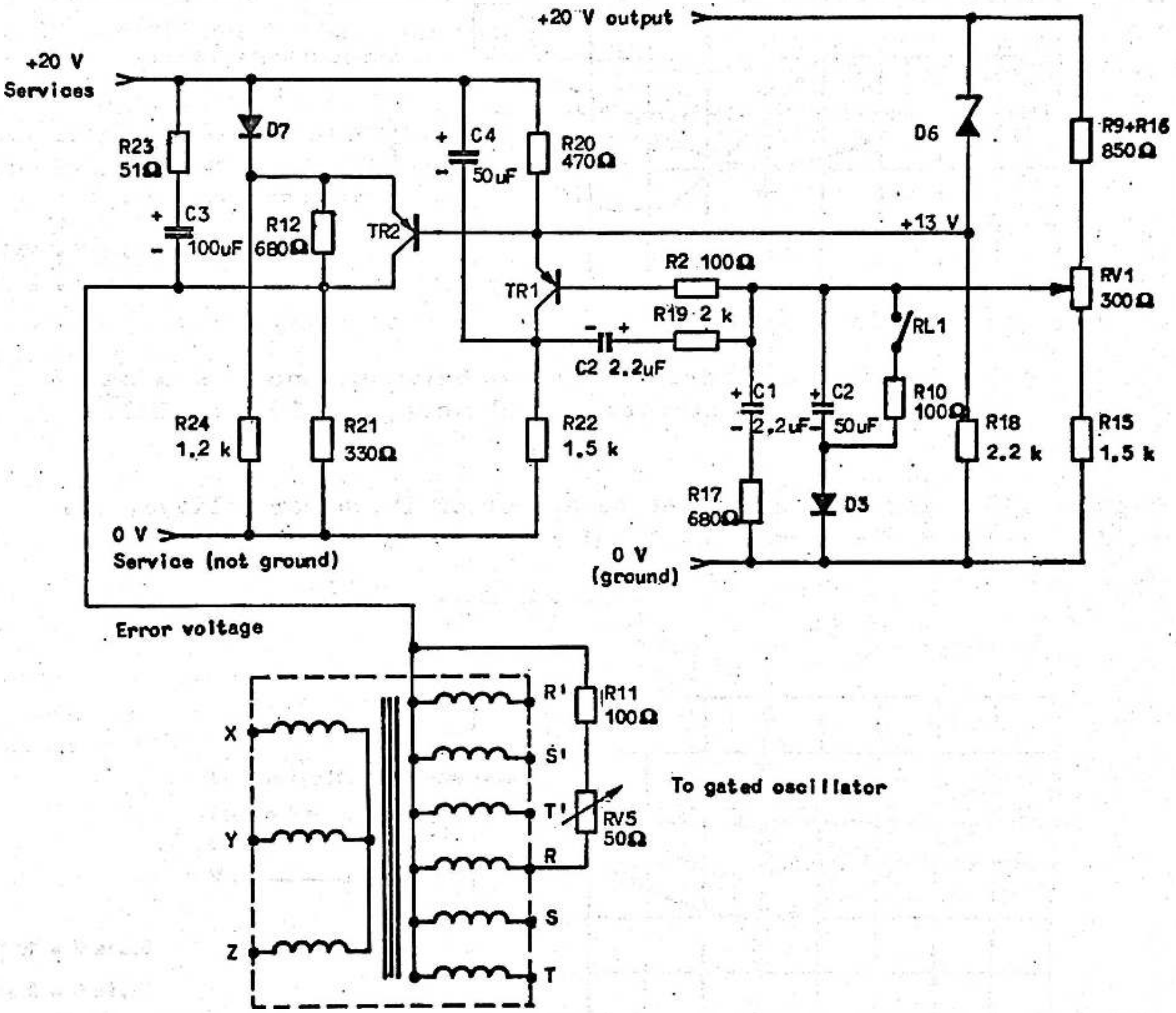


Fig. 3.16. - Error voltage to command transformer tie-up

Figure 3.17. shows the phase difference between the voltage applied to the anode of an SCR and the command voltage for the relative oscillator.

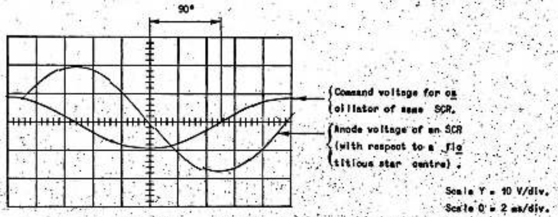


Fig. 3.17. - Phase difference between anode and oscillator command voltages of same SCR

Figure 3.18., instead, shows the behaviour of the error voltage, the command signal and the signal resultant from the sum of the two.

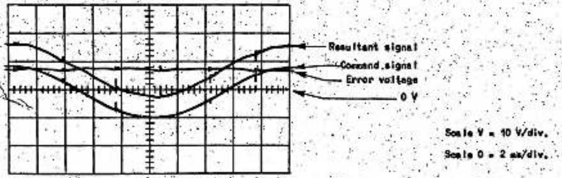


Fig. 3.18. - Sum of command signal plus error voltage

The value of the command signal can be varied by means of pots RV2 through RV7.
By doing this, the instant in which the sinusoidal wave goes through the zero is changed and, as a consequence, is also varied the instant in which the gated oscillator is triggered.
Each of the six secondaries of T2 transformer has its own pot. When adjustments are made, the pots must be trimmed in such a way as to have all six SCRs in conduction for an identical length of time. The purpose of these pots is to adapt the Power Supply to possible unbalances in the phase relationship of the mains supply.
It is thus necessary to touch-up the T2 pots every time the Power Supply is relocated.

3.4.5. - Gated oscillator

The circuit diagram shown in Fig. 3.19. gives a simplified view of one of the six gated oscillator circuits.

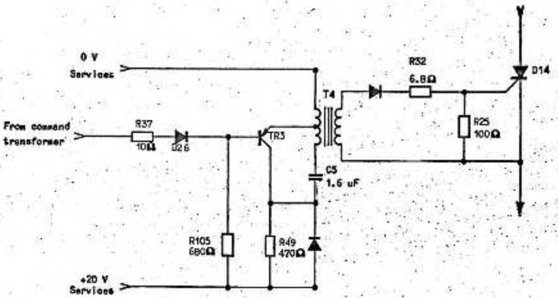


Fig. 3.19. - Gated oscillator circuit diagram

When the anode voltage of D26 is positive with respect to the Services 0 V, transistor TR3 is cut-off with capacitor C5 charging through the transformer primary windings and resistor R49.
As soon as D26 anode voltage becomes negative with respect to the Services 0 V, transistor TR3 goes in saturation. The toggle time is very short because of the positive feed-back obtained through the T4 transformer centre tap which puts a positive potential on the emitter of TR3.
See Figures 3.19. and 3.20.

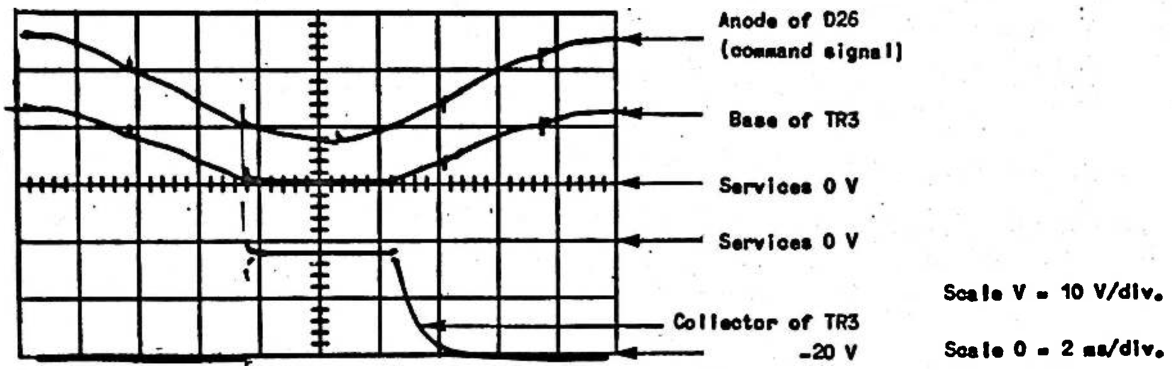


Fig. 3.20. - TR3 base and collector voltage

Fig. 3.21. shows signal waveforms on the emitter of TR3 and on the primary of T4.

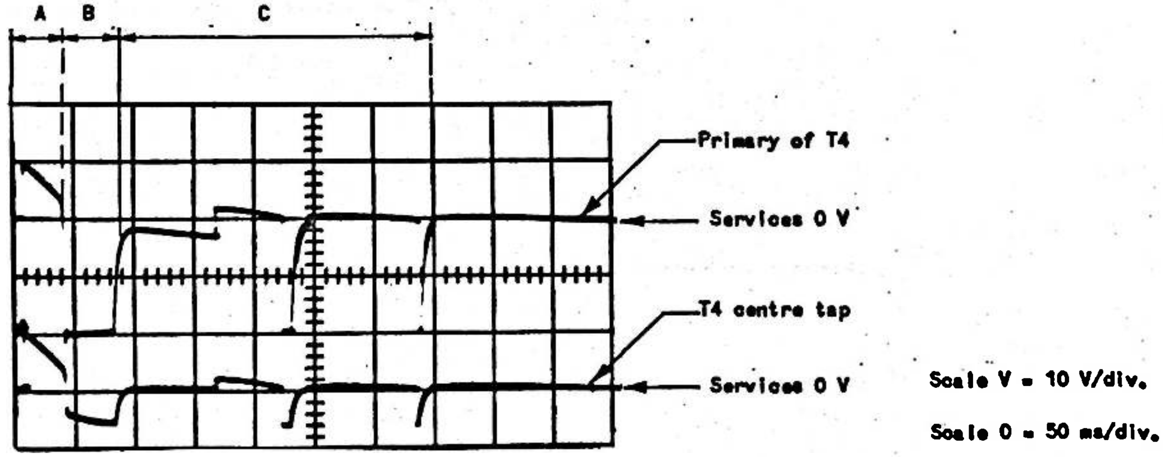


Fig. 3.21. - Waveforms on T4 primary

As the discharge current of C5 on T4 decreases the positive feed-back current on the emitter of TR3 goes down correspondingly. At a given point, TR3 goes out of saturation giving out a decreased collector current which causes the collector voltage to go towards the -20 V. Capacitor C5 begins to charge up causing transformer primary current reversal.
The reversal of the current on T4 primary induces the positive feed-back on the emitter of TR3 to go negative. TR3 cuts-off.
The stopping of current on T4 primary causes a negative voltage peak. This pulse would reach very high values were it not limited to -20 V by diode D44. See portion B of Fig. 3.21. As soon as this transient is finished, TR3 goes back to the conducting state through the action of the negative portion of the command signal on the base. But because the negative portion of the command is initially not very negative, small noise peaks can still cut it off. This is demonstrated by portion C of Fig. 3.21.
These sort of cut-offs can occur both at the start and finish of the TR3 switch-on command. No damage or malfunction can occur to the Power Supply even if several cut-ons and offs are experienced.
Fig. 3.22. shows the behaviour of the signals, used to drive an SCR gate, present on a secondary of T4.

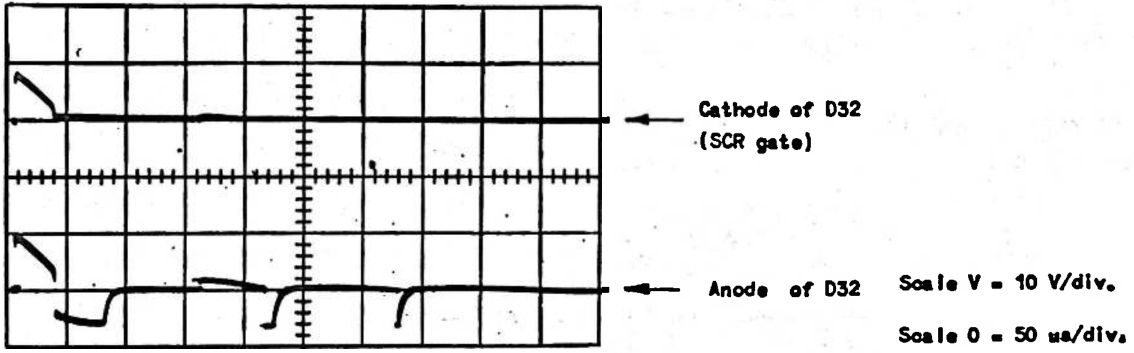


Fig. 3.22. - Signals on T4 secondary

3.4.6. – Rectifier bridge

The rectifier group is made up of a six phase bridge, grouping 6 normal silicon diodes and 6 silicon controlled diodes.
The waveforms shown in Fig. 3.23. were measured at a fictitious star centre. They are representative of the bridge input voltage and assume a value of 70 V peak-to-peak.

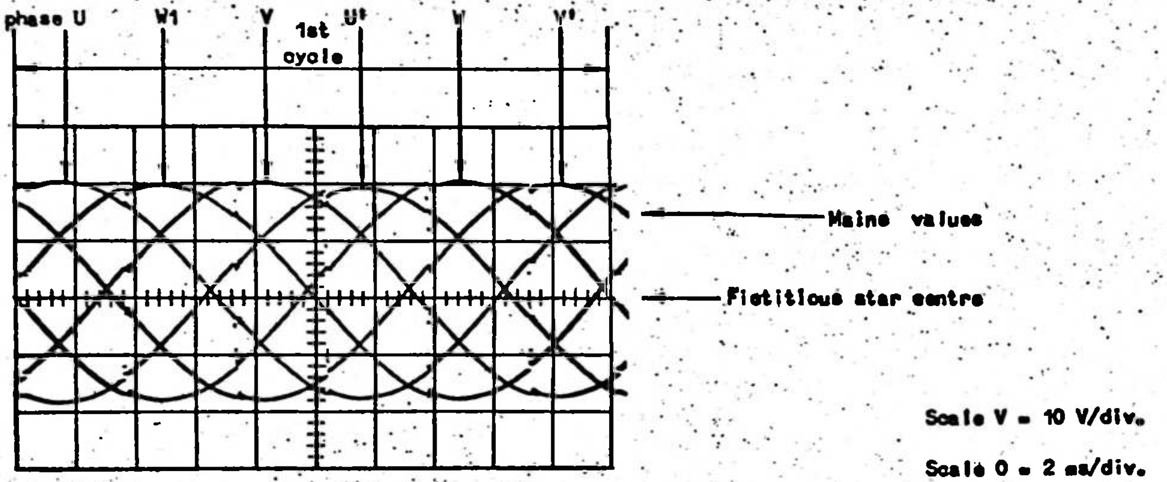


Fig. 3.23. – Rectifier bridge voltage inputs

The output of the rectifier bridge, taken on the SCR anode, is shown in Fig. 3.24.

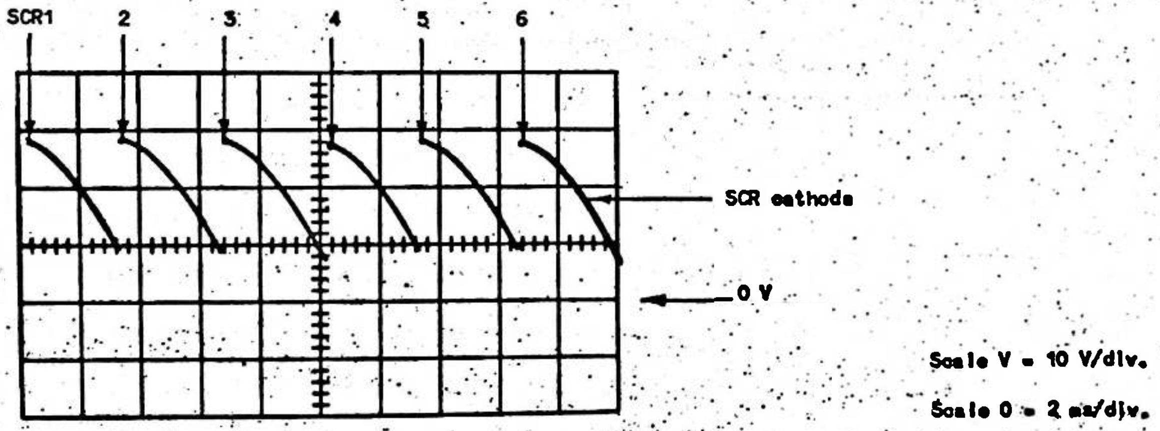
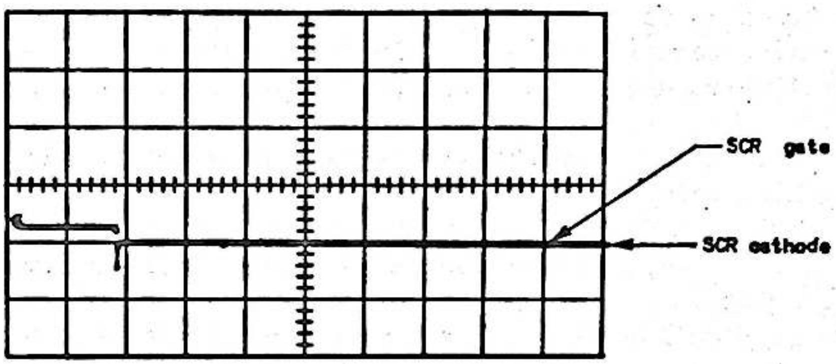


Fig. 3.24. – Rectifier bridge output voltage

Fig. 3.25. shows the voltages present between gate and cathode of the SCRs.



Scale 0 = 10V/div.

ScaleV = 2 us/div.

Fig. 3.25. - Signals on the SCR gates

The difference in the resistive characteristics between SCR gates and anodes among different examples within the same type, can give varying potential drops independently of the current that goes through them.
Failure of one or more SCR gives rise to output gaps readily identifiable with the aid of a scope.

3.4.7. - LC filter

The output of the rectifier bridge is smoothed by a filter group comprising a 3.5 mH coil and a capacitor group having a total capacitance of 0.22 F.

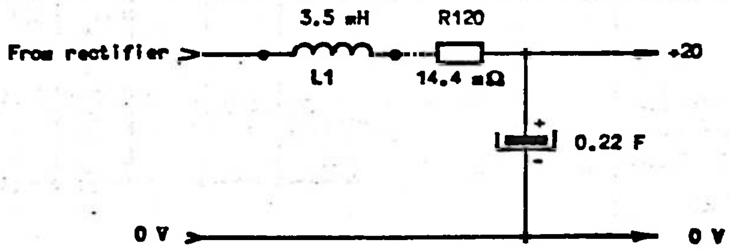


Fig. 3.26. - Smoothing circuit schematic

The 6 phase voltage applied to the smoothing circuit reaches max peak-to-peak values of 20 V, while the output peaks do not go beyond 50 mV.
The filtering property of the LC filter is increased because the frequency of pulses superimposed on the rectifier out level is 6 times the frequency of the mains supply (i.e. 60 Hz x 6 = 360 Hz).
The initial current value required at switch ON would be very high, because of the large capacitative value of the filter, if it were allowed to charge-up unimpeded.
The coil, in series to the capacitor charge circuit, goes into saturation at about 100 A, beyond which value it becomes inefficient as a charge current limiter. Because of this the switch ON current could reach peak values in the 400 A range, level sufficiently high to blow all the extra-fast protective fuses on the 6 phase bridge.
So, to prevent such eventuality, a 14 mΩ constantan resistance is put in series to the coil to reduce the charge peak to 300 A.

3.4.8. - Services supply

The Services supplies are +20 V and -20 V. The circuit is shown in Fig.3.27. The Services 0 V is not tied to ground, but is kept at a DC level of about -7 V. The reason for this is to allow the comparator circuit to function correctly, it being the only circuit that is DC tied to the output power circuit.

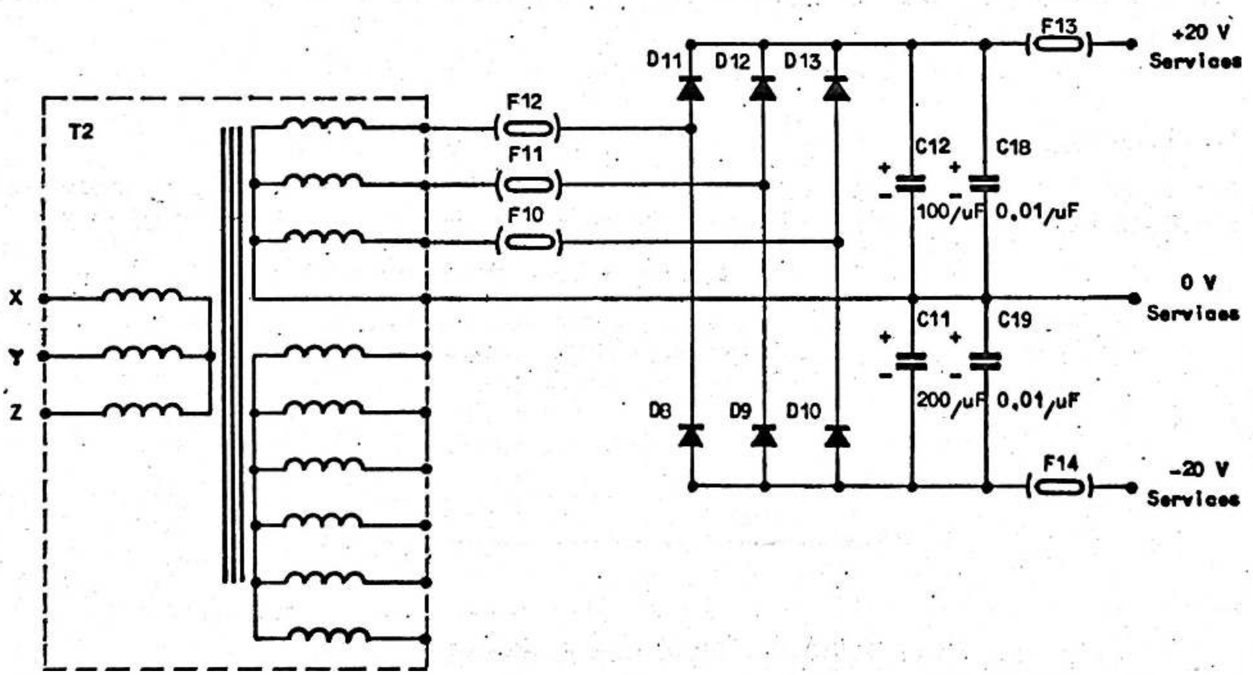


Fig. 3.27. - Services supplies circuit diagram

3.4.9. - Safety devices

3.4.9.1. - Voltage protection

The Power Supply output voltage, is restricted, in its variations, to ± 8 % of the nominal value. This restriction is implemented by the de-energizing of the main breaker TL1 whenever the output is greater than +21.6 V or below -18.4 V.
To obtain the tolerances, a part of the output voltage is compared with a reference voltage by two comparator circuits housed in the ALI 030.
The voltage fed to the comparator circuits is drawn from dividers which have one end connected to the voltage to be protected and the other to a fixed -10 V used as constant reference. This -10 V is given by the ALI 030.

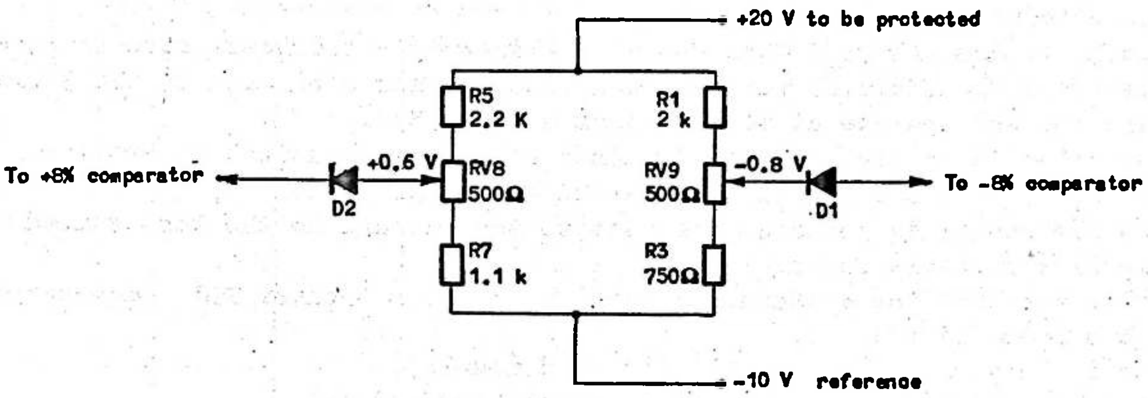


Fig. 3.28. - Supply for voltage comparators

To ensure that the comparators function at the imposed limits of ± 8%, the voltages fed under nominal conditions must be +0.6 for the +8% and -0.8 V for the -8%. Adjustment to these values is obtained through RV8 and RV9.
If the +20 V output reaches +21.6 V, the input to the +8% comparator varies from +0.6 V to +1.1 V.
If the +20 V output reaches +18.4 V, the input to the -8% comparator varies from -0.8 V to -1.3 V.
Switch ON peaks and transients during normal operation must not affect the comparator circuits. A delay is imposed to ensure that the variation is felt only after 50 msecs.
Because the delay is so long, the protection is termed as slow.

3.4.9.2. - Current protection

The protection against overcurrents for circuits within the Power Supply is done with fuses, while overload protection on the output side is done with breakers. See Fig. 3.6.
The blowing of a fuse or the trip-off of a breaker causes such a variation in the output voltage to induce main breaker TL1 to de-energize.
The opening of the breakers (see Fig. 3.6.) causes the Power Supply to fall off-load through the action of a secondary contact inserted on the hold-on circuit of auxiliary relay RL1 which, in turn, commands the main breaker TL1.
The six P1 fuses are fast blowing and are used to protect the semiconductors.

3.4.9.3. - Thermal protection

The SCR Power Supply has two points protected by thermoswitches against excessive temperatures.

- One is in the ALI 032. Consists of 3 Klixon type thermoswitches mounted on the power transformer. They are connected in serie on each of the 3 primary windings and operate at temperatures above 135°C.
- The other is in the ALI 031. Consists of one thermoswitch operating at temperatures above 90°. It is mounted on the heat sink of silicon diode D25 because it is the diode nearest to the fan and is the best suited to signal a possible fan fault.

If either one of the 4 thermoswitches opens, main breaker TL1 de-energizes and two lamps light:

- one is located on the ALI 030 (command module),
- the other lamp is on the ALI 031 (regulation module).

The lamp on the ALI 031 remains lit only for the time in which one or more thermoswitches are open.
The lamp on the ALI 030 remains on even after the thermoswitches close. To extinsguish it, the AC mains must be switched OFF.

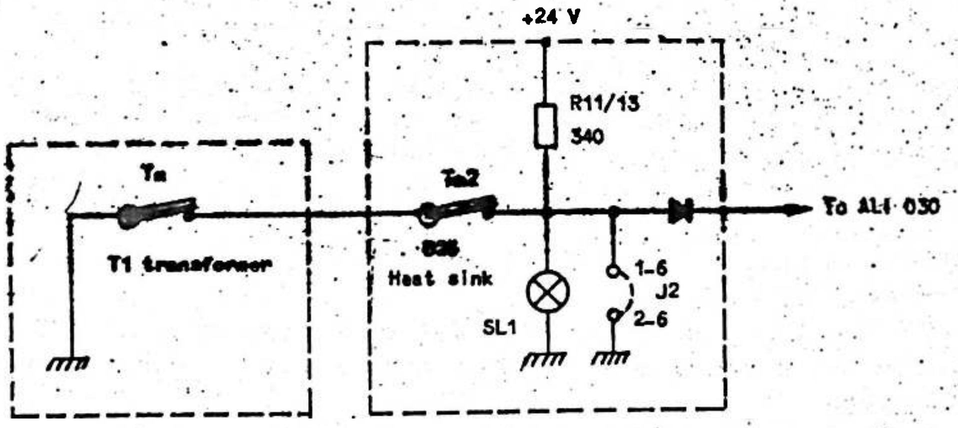


Fig. 3.29. - Thermoswitches logic

It might be necessary to have the Power Supply operate for short periods with one thermoswitch disabling it. It is then necessary to short-circuit to ground (point 1-6 with 2-6 on connector J2) the overtemperature signal to enable the energize of TL1.

3.4.10. - AC supplies

The circuits located in the ALI 031 and ALI 032 which together supply transformer T1 and T2 are shown in Fig. 3.30.

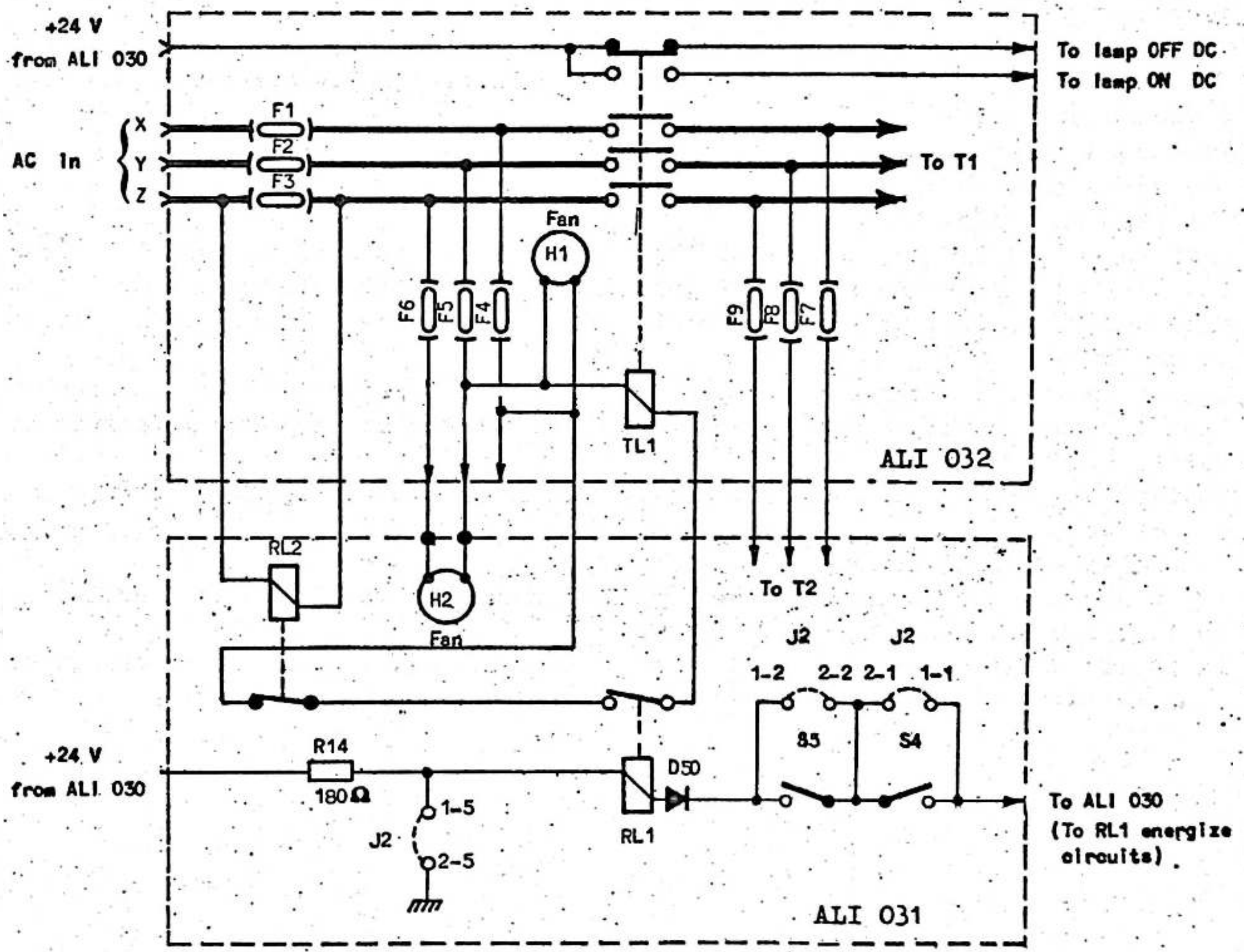


Fig. 3.30. - T1 and T2 mains input schematic

Main breaker TL1 made completes supply path to transformers T1 and T2. The making of TL1 is conditioned by the fact that RL1 is made and RL2 not made.
The purpose of RL1 is to prevent the energize of TL1 if fuse F3 has blown.
The main breaker is also prevented from energizing if either one of fuses F1, F2, F4 or F5 are blown, because the energizing voltage for it is taken downstream of the fuses.

3.4.11. - OFF load operation

The minimum load that must be connected to a Power Supply to ensure correct operation is 13 A.
For maintenance reasons or for troubleshooting purposes it may become necessary to remove the normal load from a Power Supply and to make if function with a test load.
This possibility is realized by opening contacts S4 and S5. The opening of the contacts removes supply from the P.S. itself because by de-energizing RL1 also TL1 opens.
This is caused by the opening of the secondary contacts of S4 and S5 (see Fig. 3.31.) and by the action of the voltage protective circuits that de-energize RL52. Voltage protection circuits tap source to be compared downstream of S4.
So, to prevent the sequence of events previously decribed, it is necessary to link together points 1-2-3-4, row 1 of J2, with the corresponding points of row 2. See Fig. 3.31.
In this way, the secondary contacts of S4 and S5 are put in short-circuit and the output of the voltage dividers is clamped to 0 V thus inhibiting the action of the protective circuits.
If it is only necessary to remove the load inherent to S5, it is sufficient to link 1-2 and 2-2 of J2.
If it is required to remove the load inherent to S4, it will be necessary to link 1-1 and 2-1, 1-3 and 2-3 (voltage protection) and 1-4 and 2-4.

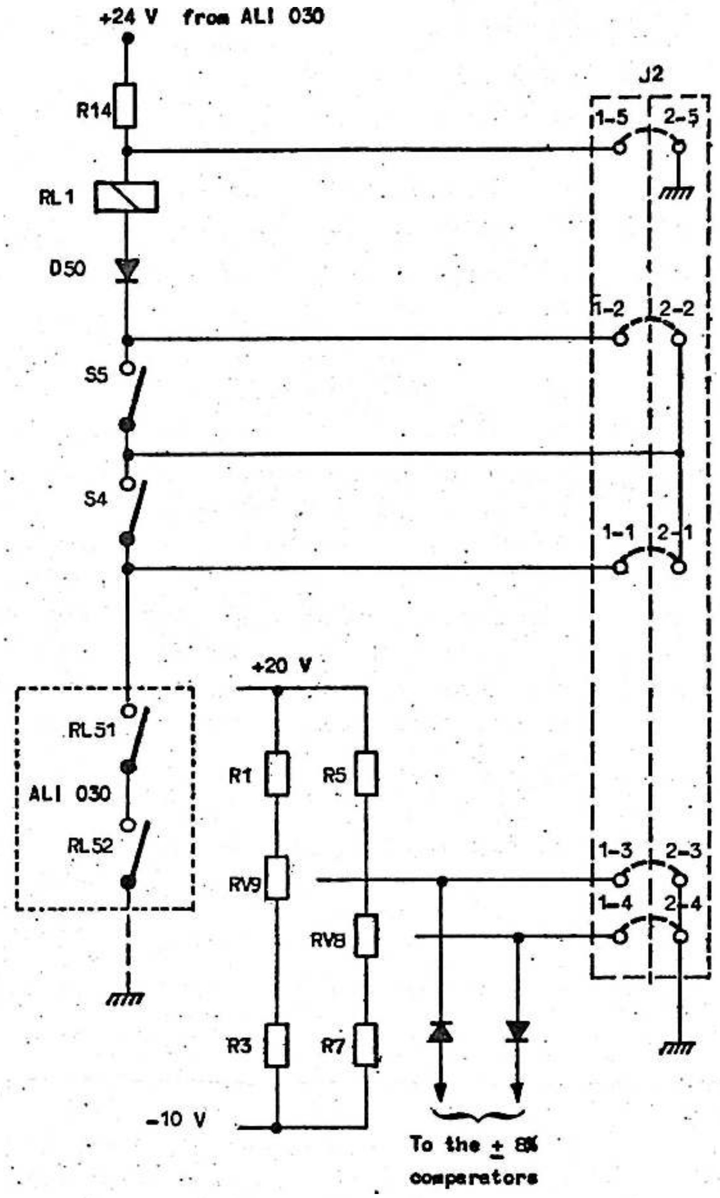


Fig. 3.31. - Links for OFF load operation

Relay RL1 becomes energized by the +24 VDC supplied by the ALI 030 when the string of contacts going to ground is made.
If the +24 VDC is short circuited to ground at R14 (point 1-5 and 2-5 of J2 on ALI 031), the energize of RL1 is prevented and also is prevented the supply of AC power to the SCR P.S. In this case, diode D50 sees that no current returns from the ALI 030 energize RL1.

4. AC POWER DISTRIBUTION

4.1. - OPERATION

The distribution of AC supply to the various machines making up a GE 130 System is done by means of an assembly of interconnected Elementary Units consisting of:

ALI 260
ALI 280
ALI 290

The maximum number of ALI 260 that can be utilized is 4. The slaving between the various distribution units is realized by using a VAR 591.
The ALI 260 is an E.U. having the same physical dimensions of an SMN module and is housed in the same wing that holds the Power Supply for the MZ4 Printer.
Those systems that use three ALI 260s, have two of them fitted in the MZ4 Power Supply wing and the third in the MTC wing.
If the system requires four ALI 260s, the first 3 are housed as said previously, while the 4th one is located differently, depending upon the system configuration.
The following equipment is mounted on the ALI 260:

1) - A special plug for mains connection through and individually insulated five core shielded cable.

2) - A series of apertures for AC cables going to the various units.

3) - A main 3 phase general breaker upstream of the whole system.

NOTE

Breakers are magneto-thermic switches having 3 distinct positions:

1 - ON - Switch closed or made.
2 - TRIPPED - Position caused by an overload.
3 - OFF - Switch open or isolated.

It is possible to go form TRIPPED to ON only if everything is functioning correctly (overloads or faults removed). Otherwise it is not possible to manually shift the breaker to ON.

4) - A maximum number of four 3 phase breakers located upstream of the 4 output lines. If operation in required at 117 V, only one phase and neutral is used. A single pole breaker is fitted on the phase line.

The ALI 260 can be utilized to supply a load not greater than 24 A, derived through the four available 3 phase outputs.

Whenever the number of 3 phase peripherals is greater than 4, the outputs of the ALI 260s are to be increased by the adoption of another Elementary Unit; the ALI 280.

The connection between the two E.U.s is done with a screened, 5 insulated cores cable.

The ALI 280 is the size of an SMN module and is housed inside the Disc controller wing.

All possible combinations of single and 3 phase loads can be achieved through the use either of single or 3 phase breakers apt to withstand the loads absorbed by the peripherals.

The graduation of breaker values must be such as to ensure that values are in decreasing order from the Main Breaker.

All AC supply cables are screened. The braiding is grounded at only one end to prevent ground loops.

Breakers only affect phase carrying wires. Ground and neutral lines are always in electrical continuity.

Terminal strips on the ALI 260 and 280 are the connecting points for ground and neutral wires of all the cables going there.

The neutral wire is kept isolated from the system ground.

All ground wires and screening braids are directly connected to the metal structures of the equipment.

The Power Supply, and usually also the peripherals, are connected to the AC through an L.C. filtering unit: the ALI 290. It is an E.U. normally fitted inside the equipment that uses it. Has a Hubbel plug and cable output aperture and is used to prevent the propagation of noise along the AC supply cable. This obviates interference between the single units making up the system.

Mains noise is filtered away by L.C. filter boxes located inside the ALI 290. Some peripherals have their own filter networks built-in (CPZ 103, CRP 100 and DSS), while others do not require any filtering at all (CRZ 100).

The latter ones are connected directly to the AC distribution panel (ALI 260 or ALI 280).

Fig. 4.1. shows the various possibilities of connection between ALI 260, ALI 280 and ALI 290.

The ALI 260 and 280 may be adopted to the various configurations that a GE 130 can assume. This possibility is given by the fact that either single or 3 phase breakers, with adequate load carrying characteristics for the number of peripherals connected, can be fitted to the ALI 260 and 280.

The figure only shows a theoretical number of breakers which can vary from system to system.

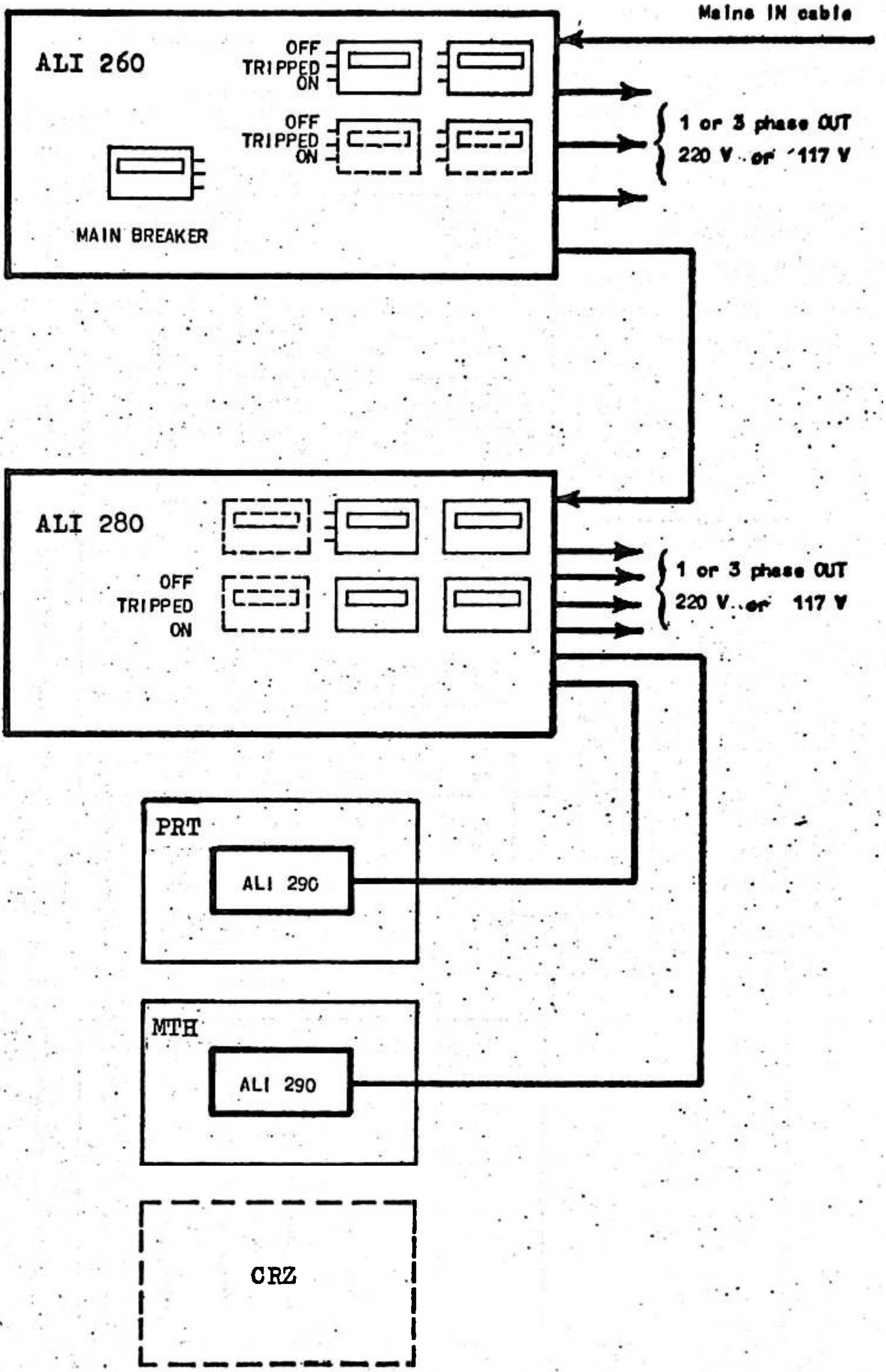


Fig. 4.1. - ALI 260-280-290 connection principle

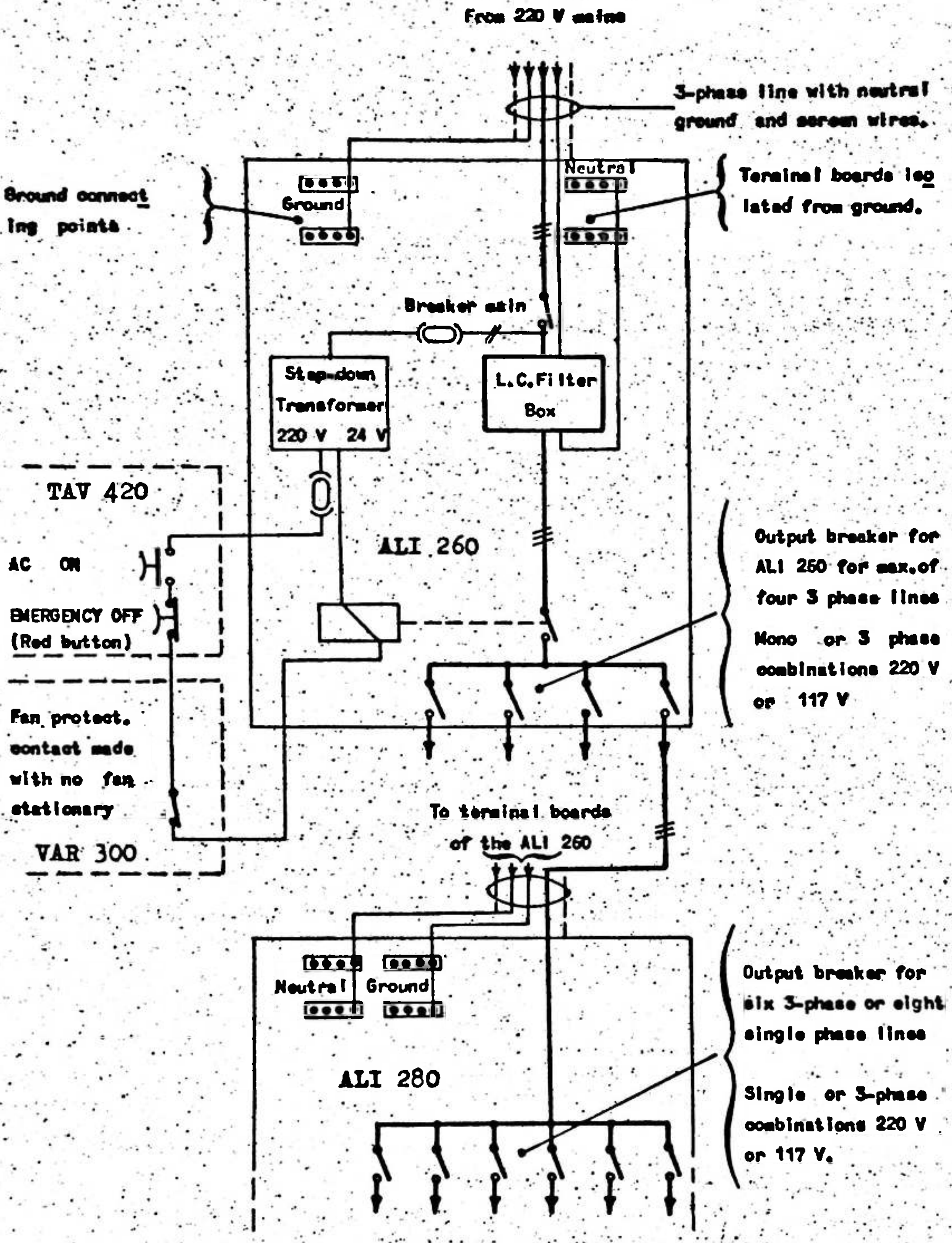

From 220 V mains
3-phase line with neutral ground and screen wires.
Ground connecting points
Ground
Neutral
Terminal boards isolated from ground.
Breaker main
Step-down Transformer 220 V 24 V
L.C.Filter Box
TAV 420
AC ON
EMERGENCY OFF (Red button)
ALI 260
Output breaker for ALI 250 for max.of four 3 phase lines
Mono or 3 phase combinations 220 V or 117 V
Fan protect. contact made with no fan stationary
VAR 300
To terminal boards of the ALI 260
Neutral
Ground
ALI 280
Output breaker for six 3-phase or eight single phase lines
Single or 3-phase combinations 220 V or 117 V.

Fig. 4.2. - AC supply circuits

4.2. - INTERCONNECTIONS BETWEEN ALI 260

A GE 130 system, in its basic configuration, requires two ALI 260. Any subsequent addition to the system is an extra load on the pair of ALI 260s.
An addition of an ALI to the basic pair brings the output to 72 A while four ALI 260s give-out 96 A.
Each ALI 260 receives its mains input through an individual cable with a Hubbel plug.
A slaving system, given by the VAR 591, allows the de-energizing of all the ALI 260 breakers disconnecting any particular mains input cable.
Relays RL1 and RL2 of the VAR 591 are always made, while relays RL3 and RL4 are utilized as follows:

- for two ALI 260, they are fitted across RL3B and RL4B,
- for three ALI 260, they are fitted across RL3A and RL4B,
- for four ALI 260, they are fitted across RL3A and RL4A.

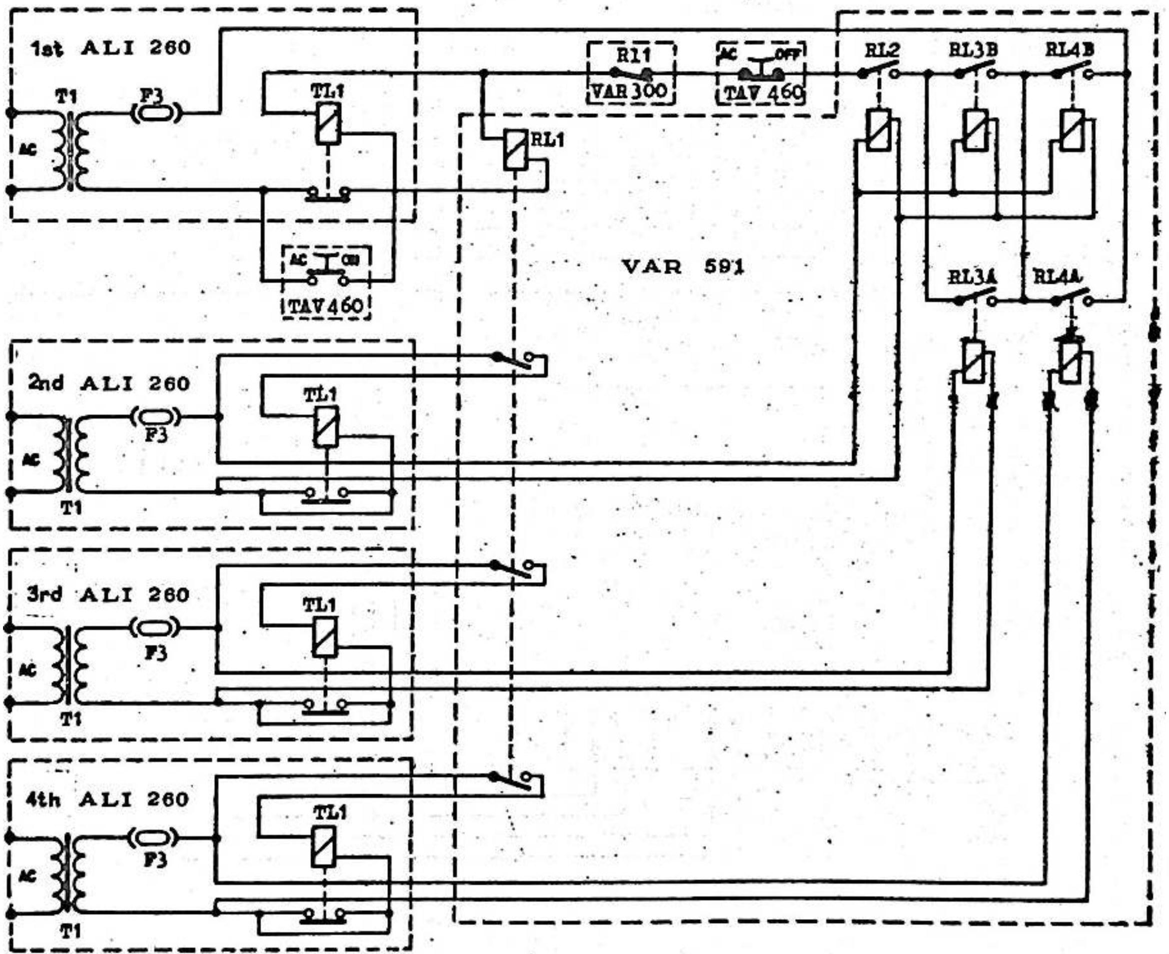


Fig. 4.3. - Interconnections between ALI 260

4.3. - FAN PROTECTION

All GE 130 subsystems are forced air cooled. Each individual fan is protected by one of two systems:

- with a stall vane that operates a microswitch,
- with a resistance heated thermoswitch cooled by air flow.

Thermoswitches or microswitches on each fan module are parallel connected and their status fed by two leads to the fan supply terminal board.
All modules are parallel connected and go to the terminal board on the VAR 300.
The VAR 300 is an E.U. fitted in the base of the Power Supply wing. Externally it has a toggle switch and a terminal board. Its purpose is to switch OFF the whole system if at least one fan fails to start, run or operate correctly. See Fig. 4.4.

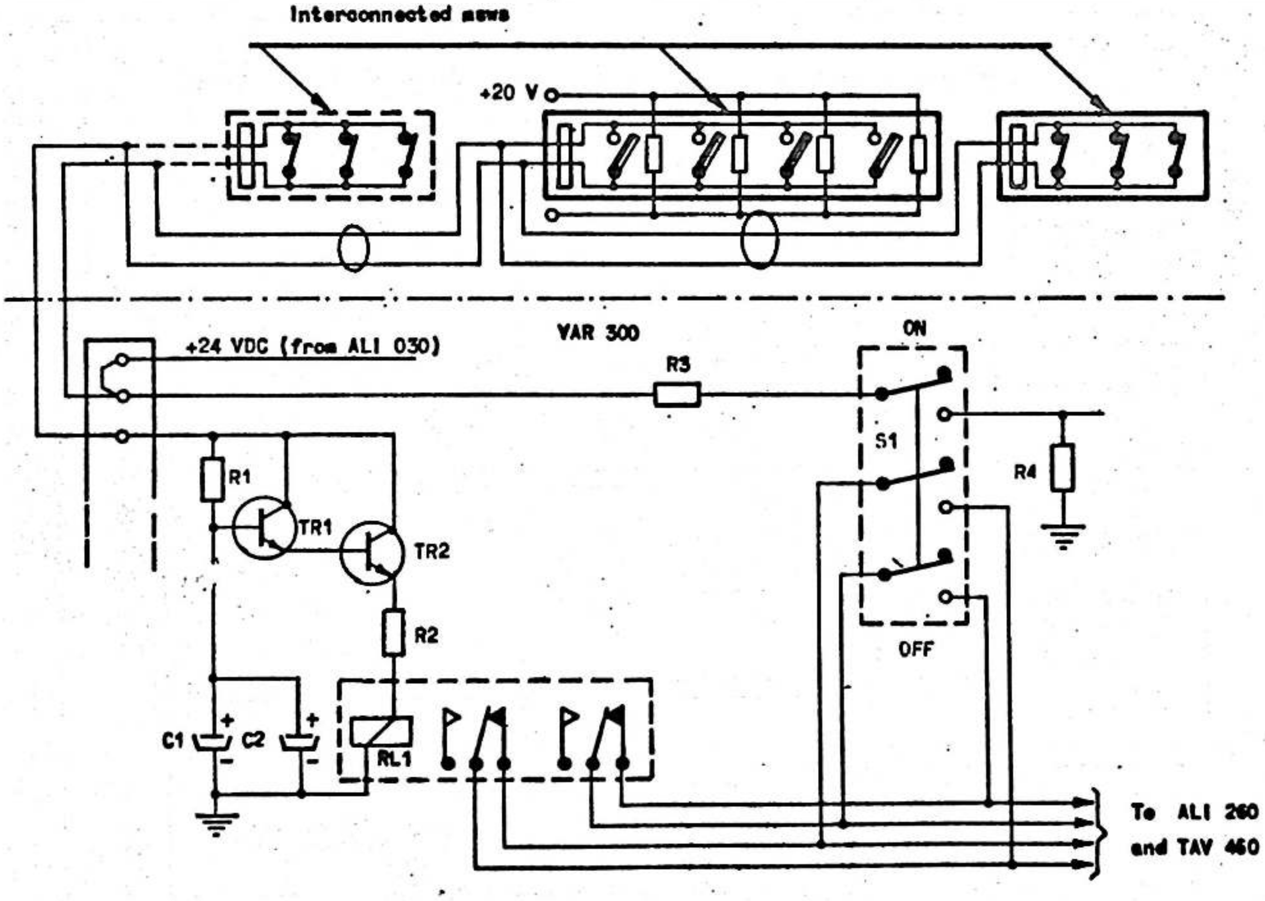


Fig. 4.4. - Fan protection circuit

The VAR 300 has a delaying circuit which energizes RL1 about 10 secs after the msws have made.

When the AC ON pushbutton is depressed, on the TAV 460, the main breaker on the various ALI 260s are energized giving AC power to the whole system.

The fans take less than 10 secs to reach rated RPM. When they have reached such a speed, their relative msws open cutting supply to the delaying circuit and to relay RL1.

During fan run-up and while the msw pertinent to each fan is closed, transistors TR1 and TR2 have 24 VDC applied to them. The base voltage of TR1 tries to reach the +24 V with a time constant given by R1 (C1 + C2).

Emitter followers TR1 and TR2 put on relay RL1 the amplified change current of C1 + C2. So, about 10 secs after the AC ON pushbutton has been pressed, the amplified charge current reaches a level capable of energizing RL1, if no msw has opened in the meanwhile.

If at this point a msw closes because a fan is running in an abnormal manner, the main breaker of the ALI 260 de-energizes and power is removed from the whole system.

To localize the fault, it will be necessary to run the system without the full fan complement. To achieve this the toggle switch S1 will have to be positioned in OFF with the result of short-circuiting the contacts of RL1.

As a safety precaution, a contact of switch S1 is utilized to forward a positive level to the ALI 030 to disable the switch ON of the system +20 V power supply. This system simulates an overtemperature condition.

5. CONTROL PANEL-ALI 030

5.1. - GENERAL

The Control Panel can be connected to a maximum number of 4 Power Supply units each made up of an ALI 031 + ALI 032 (SCR Power Supply) or to an ALI 150 (Switching Power Supply).
The principal function is performed by a relay which, through its various contacts forwards AC power to the several Supply units.
The relay drive circuits are controlled by two factors:
- temperature level of some components,
- output voltage of the Supply units.

In the event of a fault, a timing circuit disables the effect of the ON pushbuttons for about 3 secs from start of pressure. If the DC voltage has reached the ± 8% range levels within 3 secs, the ON pushbuttons are enabled, if otherwise, even repeated attemps will give negative results.
Fig. 5.1. shows cable interconnections between the Control Panel, Operator Panel and Power Supply units.
Fig. 5.2. shows the block schematic diagram of the various components that make up either an SCR or a Switching Power Supply.
The ALI 030 produces the following DC Services supplies:

a) +24 V, utilized by the relay circuits.
b) +40 V, used by the threshold level discriminator circuits.
c) +10 V, reference voltage for the comparators used to sense the ± 8% on negative voltages.
d) -10 V, reference voltage for the comparators used to sense the ± 8% on positive voltages.

These voltages are present from the moment ON is pressed and right up to the pressure of AC OFF.

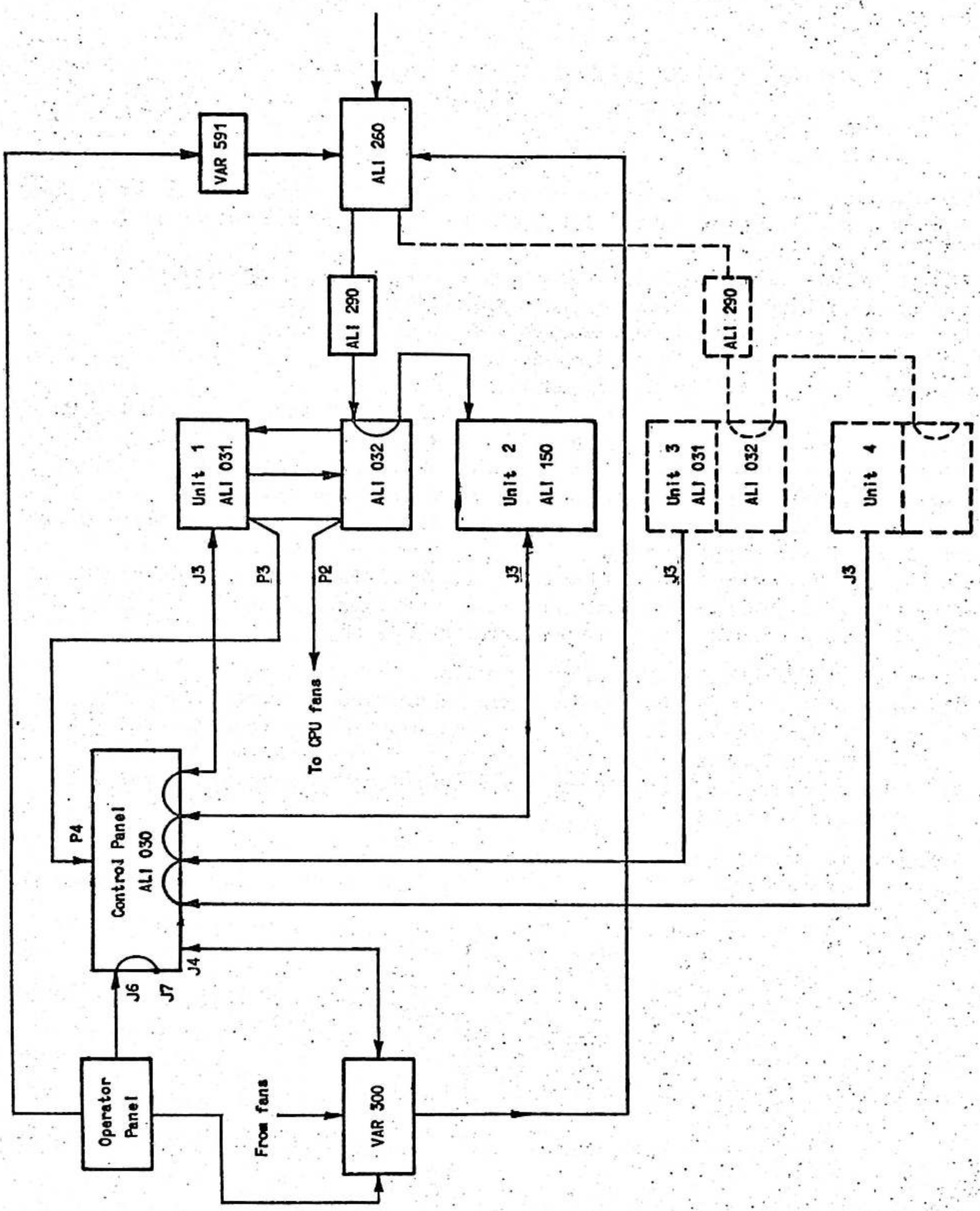


Fig. 5.1. – Link-up between Operator and Control panels and supply

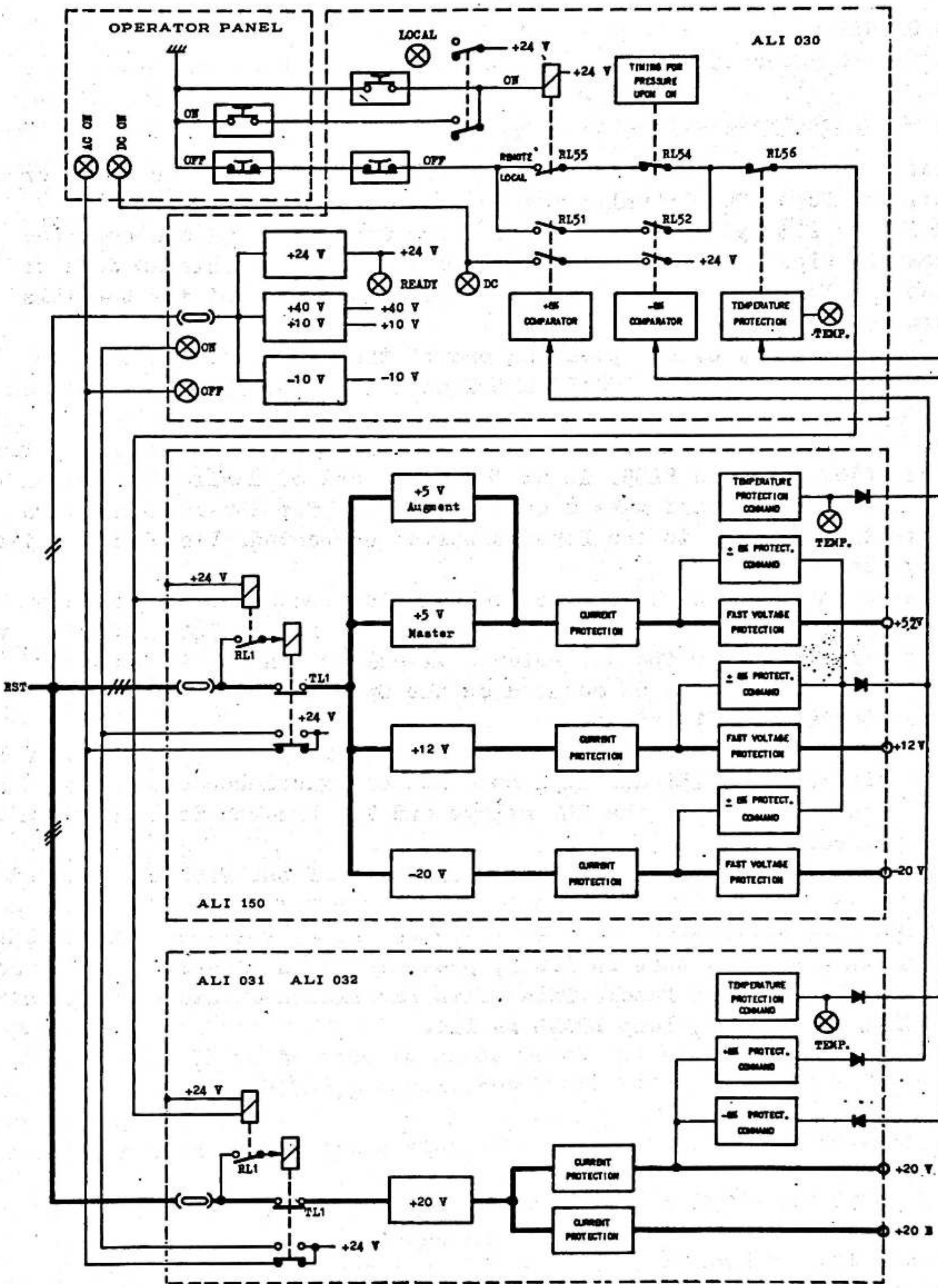


Fig. 5.2. - Power supply block schematic

5.2. - OPERATION

5.2.1. - Switch-in

When lamps READY and OFF on the ALI 030 and lamp AC ON on the Operator Panel are lit, the Power Supply units may be switched-in.
Lamp READY is lit by the +24 V, while lamps OFF and AC ON are supplied thru the normally closed contacts of the TL1 main breakers. This is done to extinguish the lamps at switch-in. The mentioned contact of the possible four P.S. are connected in parallel.
Switch-in is done by either pressing one of the two ON pushbuttons or only the one on the ALI 030, if LOCAL REMOTE switch is in LOCAL. This action energizes RL55.
One end of relay RL1, located in each P.S. unit, is put to ground through contacts RL56, RL54 and RL55. As at the other end of 8 all RL1s there is +24 V, these energize and make a continuity path for the main breakers TL1, which, in turn give AC to the Power Supplies connected. Visual indication is given by the lamp ON.
When the output reaches the correct value (plus and minus 8%), relays RL51 and RL52 make. Their contacts are in parallel to relays RL55 and RL54 which act as the hold-ons for the RL1 relays. Visual indication is given by lamp DC on ALI 030 and Lamp DC ON mounted on the Operator Panel. Supply is through series contacts of RL51 and RL52.
About 3 secs after ON has been pressed, RL54 (timing relay) energizes. If in the meanwhile relays RL51 and RL52 have not energized because the ± 8% level has not been reached, all the RL1 relays and TL1 breakes fall out even if ON is kept pressed.
This is to prevent the distribution of supplies if one P.S. unit is out of order.
Relay RL56 de-energizes for overtemperatures. No AC voltages can be supplied.
Switch LOCAL - REMOTE, when in LOCAL, prevents the switch-in of Power Supply units from the Operator Panel. This is to facilitate maintenance operations.
Under LOCAL conditions, lamp LOCAL is lit.

5.2.2. - Switch-out

The switch-out of the Power Supply units is done by pressing either POWER OFF on the Operator Panel or OFF on the ALI 030.
These two pushbuttons are series connected and, when pressed, cause an interruption in the ground tie of relays RL1. These de-energize and cause the main breakers TL1 to fall out too.
This conditions is visualized by the fact that lamps ON, DC ON and DC go out and OFF and AC ON come on.

5.3. - SAFETY DEVICES

The ALI 030 has three protective systems, apt to switch-out the Power Supply units in the event of a malfunction.

- Voltage protection,
- Temperature protection,
- Power ON sequencing.

5.3.1. - Voltage protection

Signals, proportional to the value of the output of the Power Supplies, are fed to two threshold voltage disciminators. The output goes to act on relays RL51 and RL52.

a - RL51 de-energizes when one or more of the voltages under exam goes beyond the 8% of the nominal value.

b - RL52 de-energizes when one or more of the voltages under exam goes under the 8% of the nominal value.

Each threshold voltage discriminator circuit is made up of two parts:
- Voltage divider. Housed either in the ALI 031 or ALI 150,
- Discriminator. Housed in the ALI 030.

The following figure shows the simplified circuit diagram of the +8% voltage protection
Potentiometer RV8 is trimmed to give, under normal conditions, a slightly positive output (≃ +0.7 V); output not sufficiently high to cause the conduction of TR51.
Under these conditions, transistor TR52 is on, TR53 off an relay RL51 is energized.
If the +20 V goes above 21.6 V, the output of RV8 increases of such a quantity to come TR51 to cut on, reversing the previous conditions.
The circuit that carries out the +8% protection of an SCR unit, does both the +8% and the -8% checks on the voltages given out from a Switching unit, because this unit already does the OR between the + and -8%.

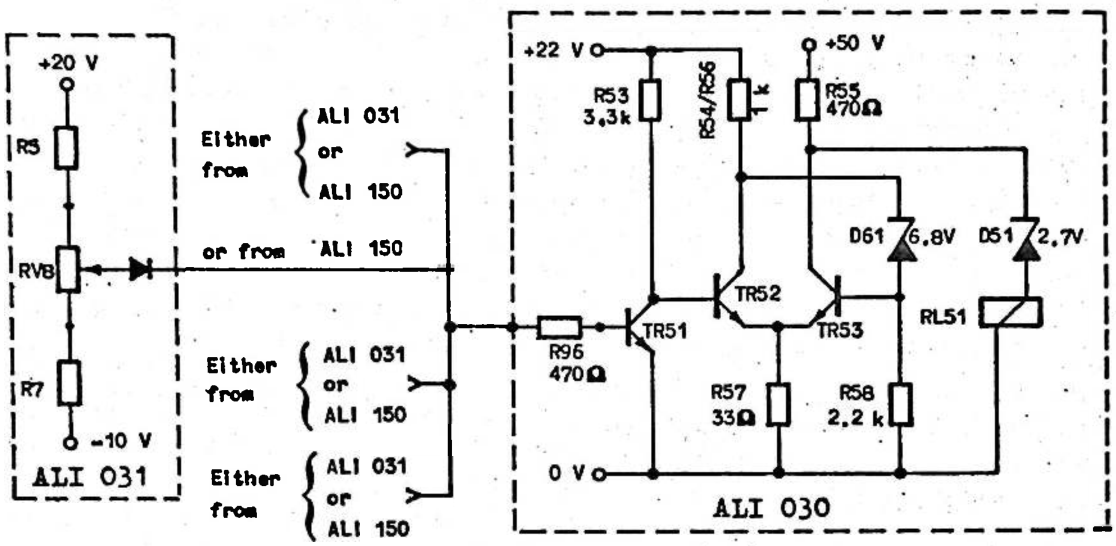


Fig. 5.3. - Simplified + 8% voltage protection circuit

The -8% check on the SCR voltages is done by a circuit similar to that used for the +8%, the only difference being that PNP transistors are used instead of NPN ones and the supply is negative instead of positive.
The output of potentiometer RV9 is about -0.9 V.
Links shown in Fig. 5.4. are to increase the intervention of the protection from ± 8% to 25 to 30%. This is achieved by shunting to ground part of the current applied to the base of the first two transistors.

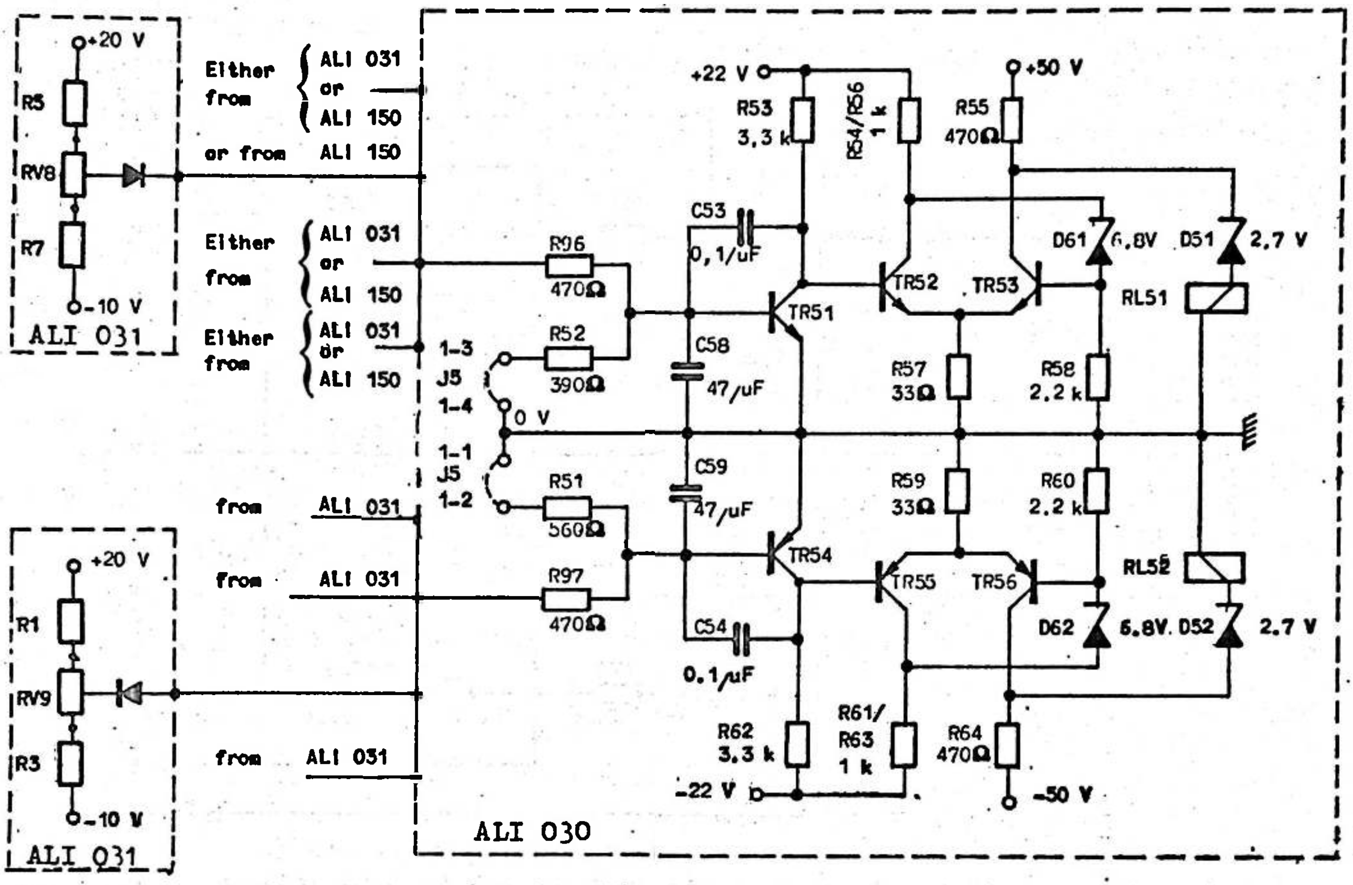


Fig. 5.4. – Simplified ±8% voltage protection circuit

Supply to the voltage protection circuit are obtained through a rectifier circuit and Zener stabilized.
Fig. 5.5. shows a simplified version of the voltage protection power supply circuit.

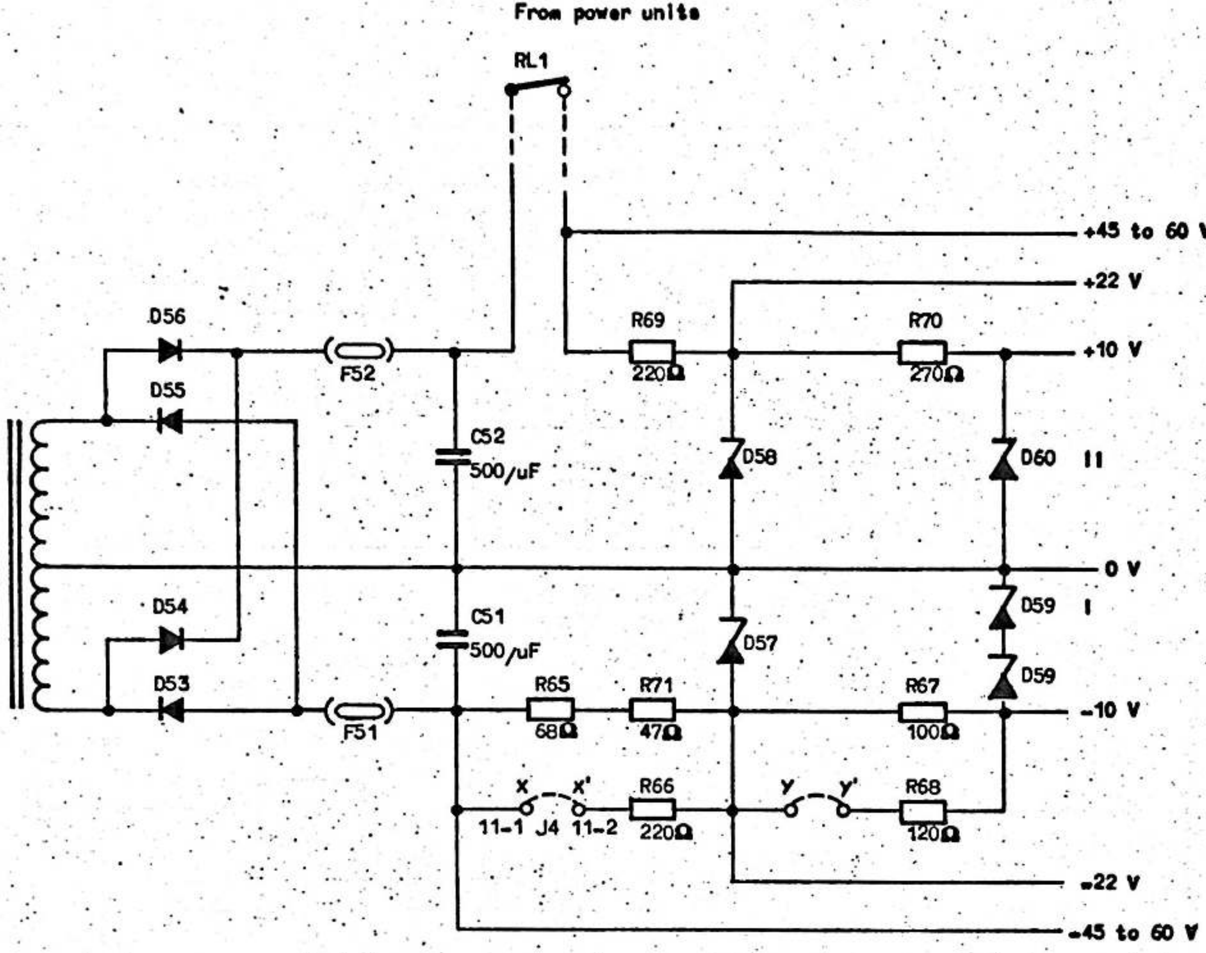


Fig. 5.5. - Voltage protection power supply circuit

The + and -10 voltages are utilized as reference in the voltage divider circuits for the ± 8% protection. Tolerance on them is ± 2% on nominal.
In each divider circuit there is a current flow of about 10 to 12 mA. For this reason, the number of voltages that can be protected depends on the current given out by the resistors on the Zener. With the shown values, the number of voltages (Power Supply units) is 3 positives plus 1 negative. The number of positive voltages can be increased to 7 by doing links X - X' and Y - Y'.
The said links allow a greater current flow towards diodes D59 I e D59 II giving an increased current availability for probable divider additions.
A contact od relay RL1 has been put in series to the positive voltages so that, when the output goes beyond the set limits, RL51 de-energizes, also bringing down TL1.
The instant in which TL1 opens, the output begins to go towards zero entering again inside the tolerance range. At this point RL51 energizes again closing, as a consequence, TL1.

If this operation were to continue, both the relay and the breaker would begin to chatter, particularly so if the output is not heavily loaded.
To prevent this sort of operation, a contact (1-3) of relay RL1 has been put in series to the auxiliary supply for the +8% protection circuit that cuts supply if the protection intervenes for high output conditions.

5.3.2. - Temperature protection

Excessive temperature conditions act on relay RL56 which can become energized through two separate paths.
- through the circuits of TR58,
- through a contact relay RL56.

With a temperature inferior to the max allowed, the thermoswitches on the ALI 031, 032 and 150 are closed. No potential is applied to the base transistor TR58, with the result that it does not conduct and relay RL56 is de-energized.
Whenever one or more thermoswitches open because of excessive temperature levels, lamp TEMPERATURE lights and a positive voltage is applied to the base of TR58, which starts to conduct. RL56 energizes lighting lamp TEMPERATURE on the ALI 030.
The energizing of RL56 causes the closure of its contact 9-11, which is the hold-on on the +24 V.
The only way to de-energize RL56 and to extinguish TEMPERATURE, is to remove power from the ALI 030 or, in other words, switch off the whole system.
The reason for the hold-on of RL56 is then to ensure that if a malfunction occurs, the Engineer can not restore working conditions by simply pressing ON, without being fully conscious of a fault.

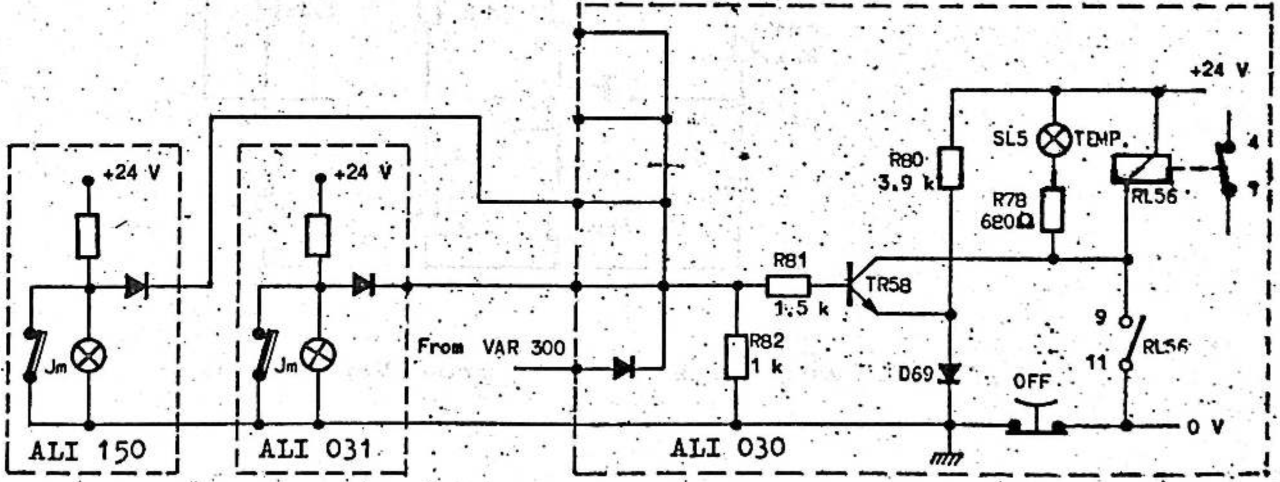


Fig. 5.6. - Overtemperature protection schematic

5.3.3. - Power ON sequency

This protection is necessary to prevent the application of power to the equipment whenever a fault condition exists.
If no fault condition exists, pressure on the ON pushbutton annuls the protection by putting series contacts 9-11, of relays RL51 and RL52, in parallel to contact 1-4 of relay RL54.
This protection acts on relay RL54, circuit action is through transistors TR57 and TR59.
Section B of the ON pushbuttons, supplies the circuit during the power - ON sequencing phase. After a time, given by CR (R76 + RV51) . (C56 + C57), unijunction transistor TR57 switches on. Through the conduction of TR59, relay RL54 energizes so cutting the +24 V supply line to the RL1 relays by means of contact 1-4.
During final check out operations, protection delay can be set through RV51, mounted on board PACO 03 on the Control Panel.
Normal delay is about 2 secs.

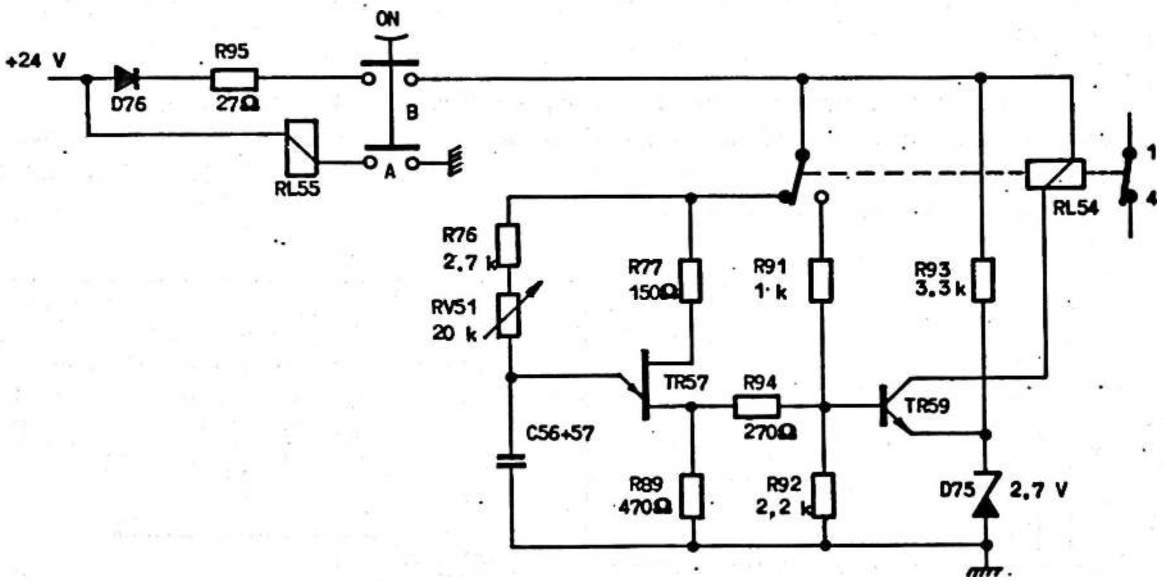


Fig. 5.7. - Power ON sequencing protection schematic

5.4. - POWER SUPPLY FOR +24 RELAYS

Fig. 5.8. shows the simplified circuit for the supply of +24 V to relays. Lamps intensity can be varied depending on their importance. The supply of such lamps is diode coupled to prevent more than one ALI 030 act on any one lamp. To this purpose, relay RL53 is fitted if more than one ALI 030 is utilized.

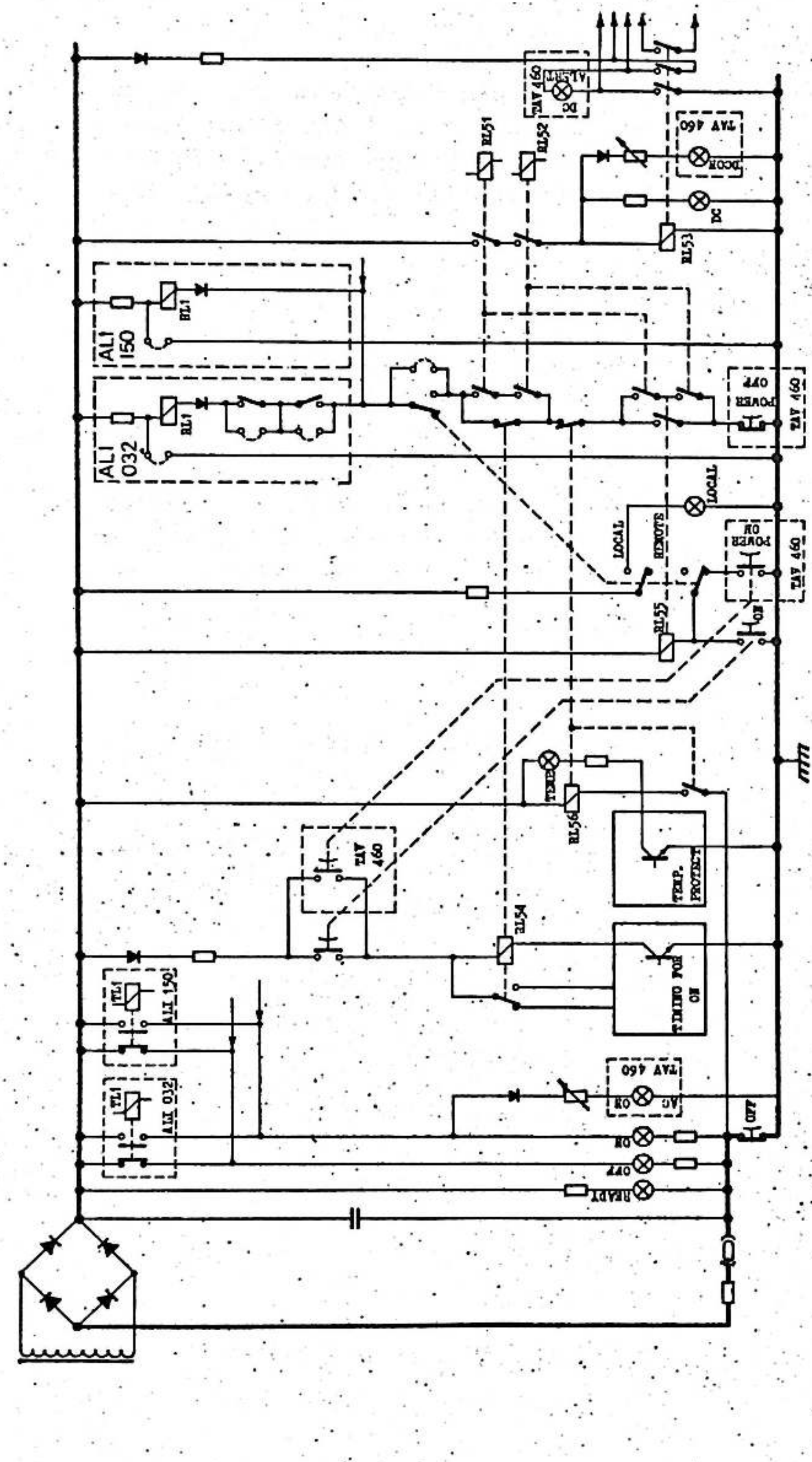


Fig. 5.8. - Power supply schematic for + 24 V relays

6. +20V POWER SUPPLY EXTENSION

6.1. - INTRODUCTION

This extension, housed in wing E, is called upon whenever the subsystems, connected to the +20 V supply, require a current greater than the 65 A, given by the Power Supply housed in wing D.
The extension enables a max current output of 130 A.

6.2. - GENERAL

Input

The extension receives the AC supply from the pertinent ALI 260 breaker through the ALI 290 mains filter. Values and tolerances are the same as those of the main Power Supply.

Output

Furnishes +20 V with a max current of 65 A.

> Note
>
> The characteristics of this extension are identical to the main Power Supply unit.

6.3. - PHYSICAL CONFIGURATION

The Power Supply housed in wing E, see Fig. 6.1., comprises:

- ALI 031 : SCR adjustment module,
- ALI 032 : SCR Power Supply module,
- ALI 290 : Mains filter.

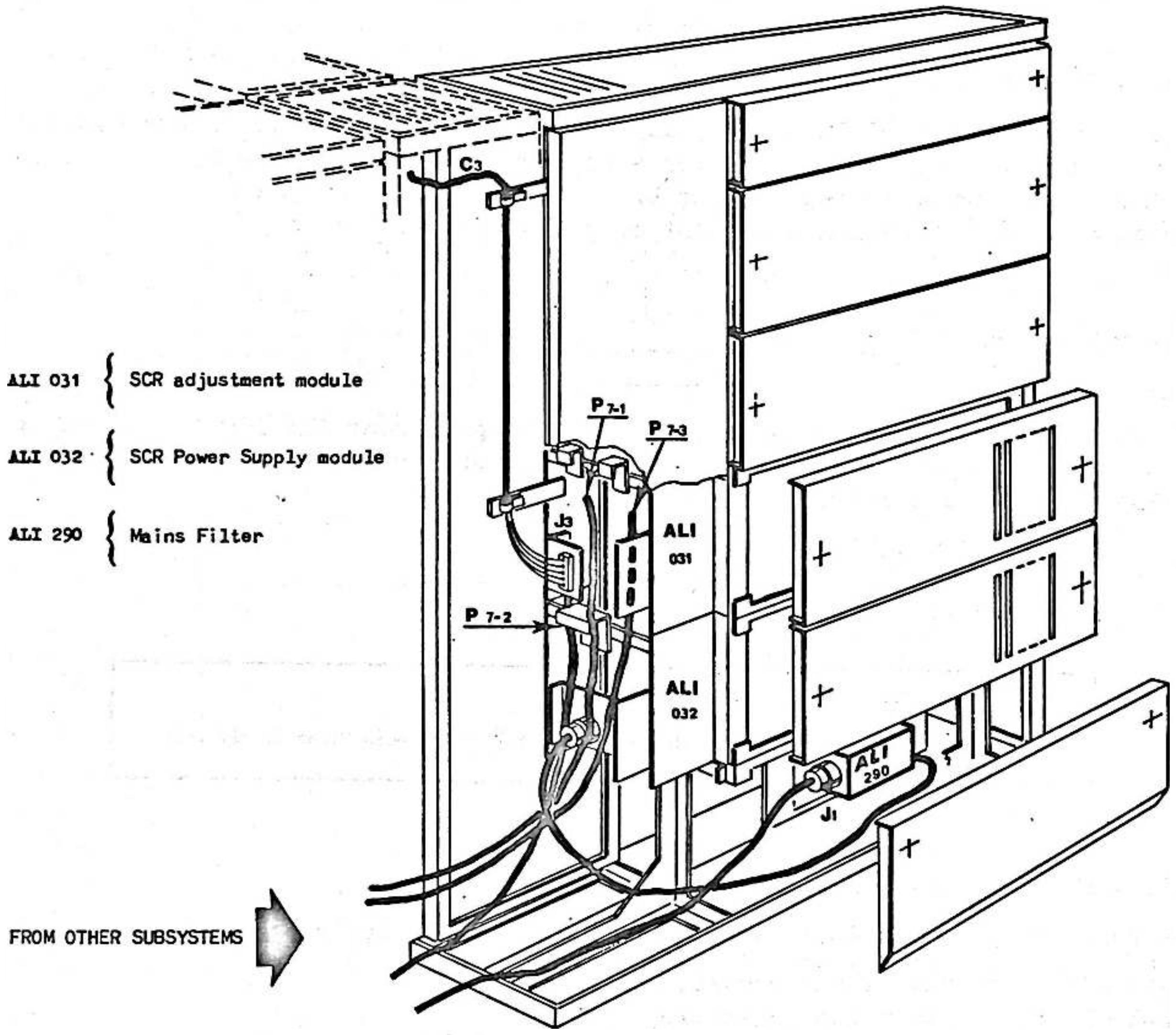


Fig. 6.1. - Physical configuration

6.4. - OPERATION

The extension functions in the same way as the main +20 V SCR Power Supply. It must be remembered that commands and indicators are interconnected between the extensions ALI 031 and the ALI 030.
Through terminals fitted on the CIF 101 cable, two jumpers are to be inserted from the ALI 030 so as to increase the current towards the voltage protection circuits Zener diodes D59I and D59II.

6.5. - CONNECTIONS

The GE 130 Installation Manual, Part nº 4.571.0.001., will give all the necessary instructions regarding the connection of this Power Supply extension to the CPU.
The unit covers will vary depending upon the layout adopted for the CPU - Power Supply - Console.

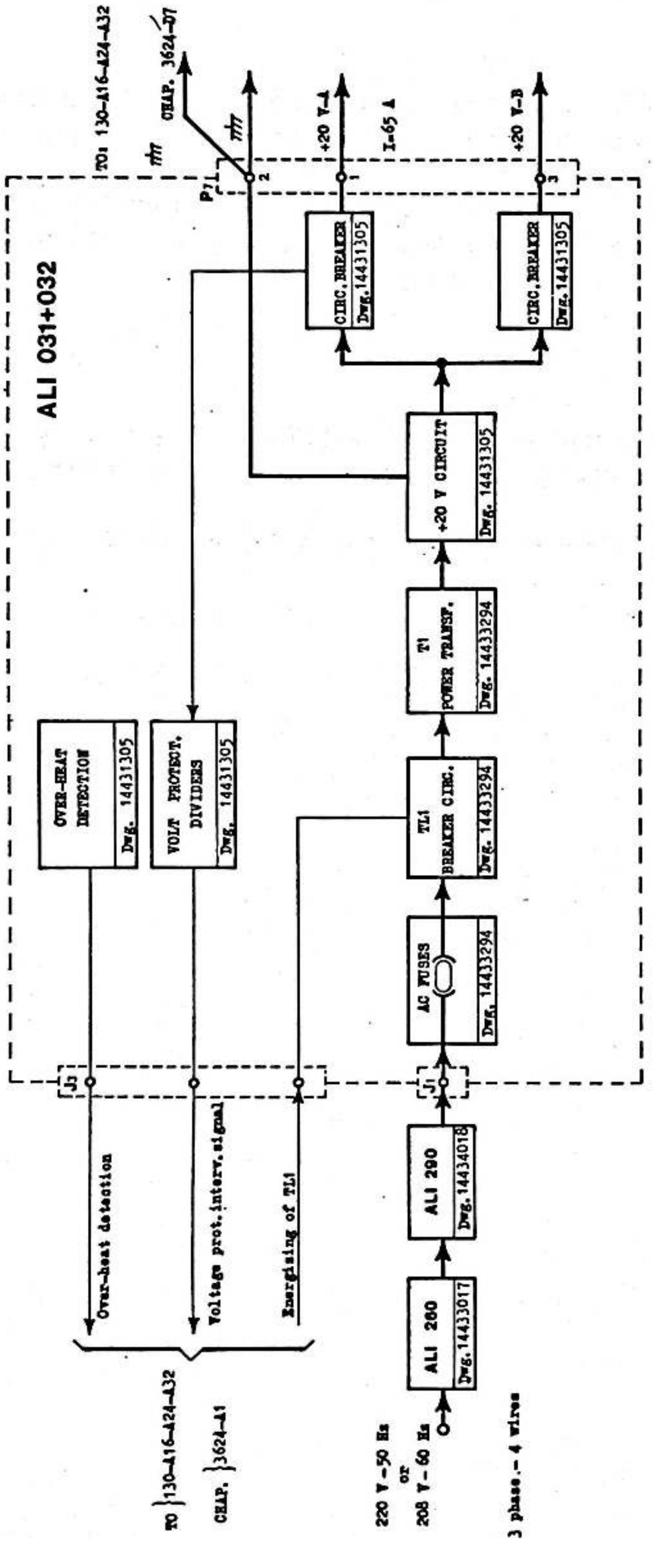


Fig. 6.2. - Block diagram

7. COMMAND PANEL - ALI 030 B

7.1. - FOREWORD

This panel has been designed to supply commands and status signals to the GE 130 Power Supply.
The ALI 030 B can govern up to 4 power units.

7.2. - FUNCTIONING PRINCIPLE

Refer to the attached circuit diagram n° 78D102102.
Transformer T3 has two secondaries:

1) 21.8 V r.m.s. and 2A I r.m.s. which, through a diode bridge (D55 to D58), outputs 24 V ± 10% to supply the power-up, switch-off and status indicator circuits.
2) 40-0-40 V r.m.s. (centre tap) which, through a diode bridge (D51 to D54), supplies the two ± 10 V ± 4% voltages for the slow voltage protection dividers.

Through the command panel OFF pushbutton, and possible OFF push-button on the operator panel (when there is no operator panel, link J6 or J7 connector contacts 1-6), the 24 V voltage is issued to ON pushbutton contact 4 and then , through J4 connector contacts 1-1; 3-1; 5-1; 7-1, to the power unit relays.

> Note
>
> The single phase supply voltage (220 V - 50 Hz or 208 V - 60 Hz) is applied to terminal strips P4 and, through fuses F51 - F52,to the transformer primary.
> To switch from one voltage to another, act on the T3 transformer.

The RL1 relay circuit closes through terminals 1-2, 3-2, 5-2, 7-2 and transistor TR53 towards ground (⏚).
To energize the various RL1 relays therefore, TR53 must be saturated.
When powering-up the Power Supply with the a.c. voltage, TR52 conducts, TR53 results cut-off and the power units are consequently cut-off.
Depressure on the ON pushbutton will supply the TR51 circuit which, however, will remain cut-off until voltage across capacitor C51 triggers Zener diode D60.
TR51, though D62, saturates TR53 with subsequent energizing of the various power units RL1 relays.
After the R54-C51 time constant, TR51 will saturate.
Supply to TR53 is only insured if, in the meanwhile, TR52 has cut-off. The TR 52 cut-off status is only insured if all the voltages have returned within

their respective tolerance range and therefore only if the IC51 output is at 0V.
If this does not occur, TR53 is cut-off and the Power Supply is consequently switched off.
The TR51 circuit accomplishes the function of a timer, so as to avoid forcing a Power Supply switch-on for approx 2 secs if the voltages are not all within tolerance.
This circuit will function as soon as the ON pushbutton is depressed.

7.2.1. - DC Indicator

Cut off of TR52 (voltages within tolerance) also determines the saturation of TR54 and consequent light-up of the DC indicator lamp.
TR55, cutting off, will in turn issue, through R82, a 24 V voltage (80 mA) to the DC lamp physically located on the operator panel.
R83 is a current limiter for the operator panel AC-ON lamp.
The 24 V voltage is in series to R83 when the power units main breaker is set to OFF.

7.2.2. - Overtemperature Indicator

This status signal is derived from the D69 SCR diode circuit.
Through diodes D81 - D70 and D82 - D71 (D70 and D71 are Zener Diodes), the D69 gate receives the ORed overtemperature signals which, triggering the SCR diode, will light-up the TEMPERATURE lamp and, through D68, cause TR53 to cut off with consequent switch-off of all the connected power units.

7.2.3. - LOCAL REMOTE Function

The panel may be isolated from the operator panel or from other panels as far as the ON command or any other power-up conditions are concerned.
It is still possible to give the OFF command from the operator panel.
The DC-ON and AC-ON indicator signals are always sent to the operator panel.
The LOCAL-REMOTE conditions are realized with switch S3 whose transfers A-B-C determine:

1) - REMOTE position (closure between 2-3)

   A - enables power-up from the operator panel

   B - does not supply SL 3 (LOCAL)

   C - enables a power-up conditioning with other Power Supplies

2) - LOCAL position (closure between 1-2)

   A - interrupts the ON command issued from the operator panel or any other panel

B - determines "LOCAL" lamp hight-up, monitoring the actual panel operating condition

C - interrupts other Power Supplies conditioning paths

Diodes D75, D74, D76

These diodes are inserted to uncouple the +24 V voltages of the various panels which may be interconnected.

7.2.4. - J4 Connector Function

This connector, consisting of 11 rows of 6 contact faston elements, has the function of interonnecting the command panel with the power units (rows 1-8). Rows 9-10-11 allow issue of signals and conditionings to other command panels. Signals exchanged with the power units are:

- 1-1 (3-1, 5-1, 7-1) Brings the +24 V on the power units RL1 relay
- 1-2 Receives the RL1 feedback, grounding it through TR53
- 1-3 Free
- 1-4 Free
- 1-5 Supplies the OFF lamp after a TL1 transfer
- 1-6 Free
- 2-1 (4-1, 6-1, 8-1) Supplies the ON lamp after a TL1 transfer
- 2-2 Receives the positive signals from the divider network of those voltages to be sent to the /uA711 (IC51)
- 2-3 Receives the negative signals from the divider network of those voltates to be sent to the /uA711 (IC51)
- 2-4 Issues the power units with the -10 V reference voltage for the slow voltage protection dividers
- 2-5 Issues the power units with the +10 V reference voltage for the slow voltage protection dividers
- 2-6 Issues the detecting circuit with the overtemperature signals arriving from the units
- 10-1 Issues the GUF with the voltage taken on C57 (-45 to -50 V; I approx 200 mA)
- 10-2 Issues +24 V to the VAR 300 to detect overtemperature conditions on the machine blowers.

.10-3 Receives the overtemperature signal from the VAR 300 and forwards it to the detection circuit

.11-1
11-2 Connected to J8-1 and J8-2 these contacts, when bridge linked, parallel resistors R85 and R86, increasing the current towards Zener diodes D82' and D82".
This enables to supply a greater number of comparison dividers (Without a jumper strap, four voltages may be protected, while up to eight voltages can be protected if the contacts are linked).
The jumper is inserted at "system level" as only then will it be decided as to how many power units are to be supplied.

Connector J4 Row 9

. 1
. 2
. 3
. 4
From time to time connection with contacts 5 and 6 of the same row , they either determine power-up conditioning to other Power Supplies or receive it

. 5 Through LOCAL REMOTE switch transfer C and D65, it is connected to the D63 cathode

. 6 Connected to the D63 anode

7.2.5. - Connectors J6 and J7

These are Socapex elements with 17 paralleled contacts and have the function of connecting the command panel to the operator panel and other command panels.
Their connections are clearly shown on the circuit diagram.

7.2.6. - Time Counter

In parallel with the ON lamp, the counter functions on 24 V ± 20%

7.2.7. - Input Terminal Strip P4

The ALI 030 B has a high voltage input terminal strip P4 with 5 K605 contacts.
Contacts 1-2 either receive the 220 or 208 V line,tapped before main breaker TL1.
Contact 5, connected to the ground ⏚ arriving from the ALI 031 P3-12, connects the ALI 030 panel reference ground ⏚ to the power unit ground.
Connections to P4 contacts 1-2 are made with a 4 conductor UL cable (phases X, Y, ground) and screen.

The ground and screen wires are screwed to the ALI 030 structure, appropriately tagged with a ground label, above terminal strip P4.

7.3. - CONDITIONING

The conditioning mechanism is the following

- 1st Case: A. conditions B

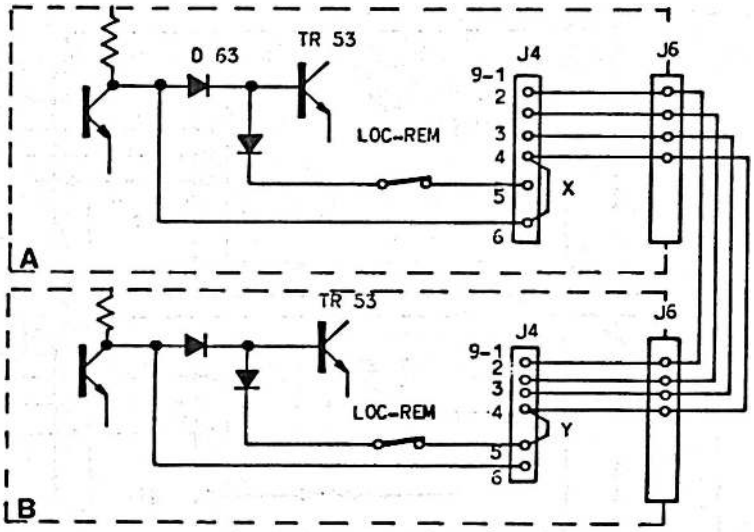


Fig. 7.1

- 2nd Case: A conditions B which in turn conditions C

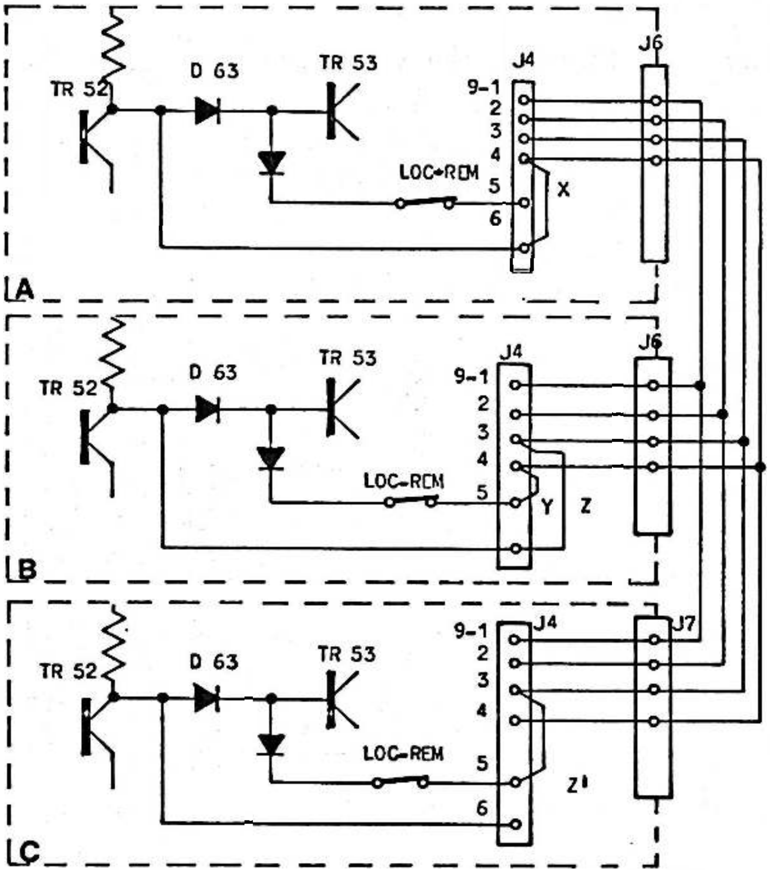


Fig. 7.2

Bridge links (jumpers) X-Y-Z-Z' are inserted on the external side of J4 upon conditioning. With this sequence, the max number of panels which may be chain conditioned is 5.
This possibility is limited by the number of J4-9 contacts, by connectors J6, J7 and by the TR52 collector current.

- 3rd Case: A conditions B, C, D

The dynamics of a 4 panel conditioning will result evident by referring to fig. 7.2.
In such cases, only when A functions may the others be switched on.
What previously stated in par. 7.2.3., that is to say, moving the LOCAL REMOTE switch, the various panels B. C. ...... become independent, still holds true.

7.4. - VOLTAGE PROTECTION

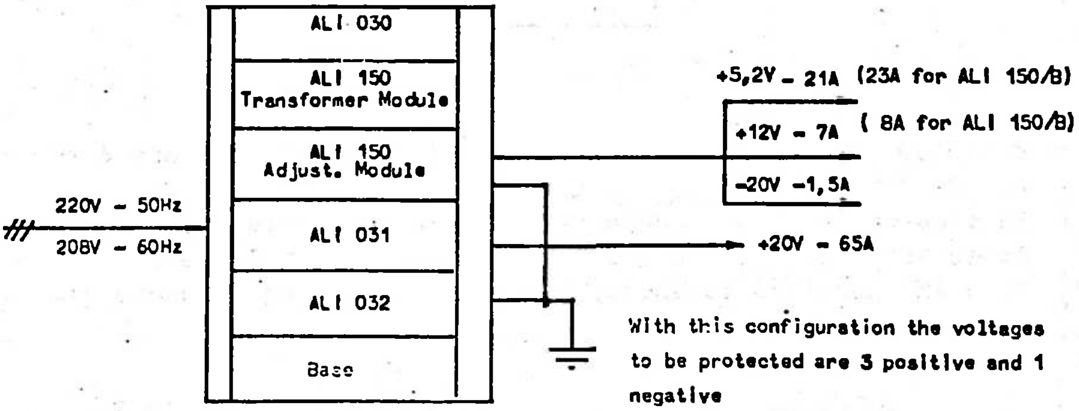
The voltage protection in the new ALI 030 B has been realized with the aid of the /uA711C integrated circuit (IC51) whose output drives TR52.
As the ALI 030 B is interchangeable with the A-L version of the ALI 030, the /uA711C detects the voltage variations which occur on the ALI 031 dividers and the signal issued by the OR of the2/uA711Cs located on the ALI 150 transformer module boards PIPA and SETE.
Through connector J4-8-2, the voltage variations of the ORed /uA711Cs are sent to the IC51 "NON INVERTING INPUT" input 4.
The ALI 031 voltage divider outputs are issued to the ALI 030 through connector JA contacts 2-2 and 2-3.
The output of the negative variation divider is sent to the IC51 "INVERTING INPUT" input pin 7, while that of the positive voltage variation divider is sent to the "NON INVERTING INPUT" input 4.

7.5. - DC ALERT

This status signal, present on the ALI 030 A-L, has been eliminated as no longer utilized on the ALI 030 B.

7.6. - GE 130 SUBSYSTEM and GE 130 + EXTENSION

A) GE 130



With this configuration the voltages to be protected are 3 positive and 1 negative

Fig. 7.3

B) GE 130 + EXTENSION

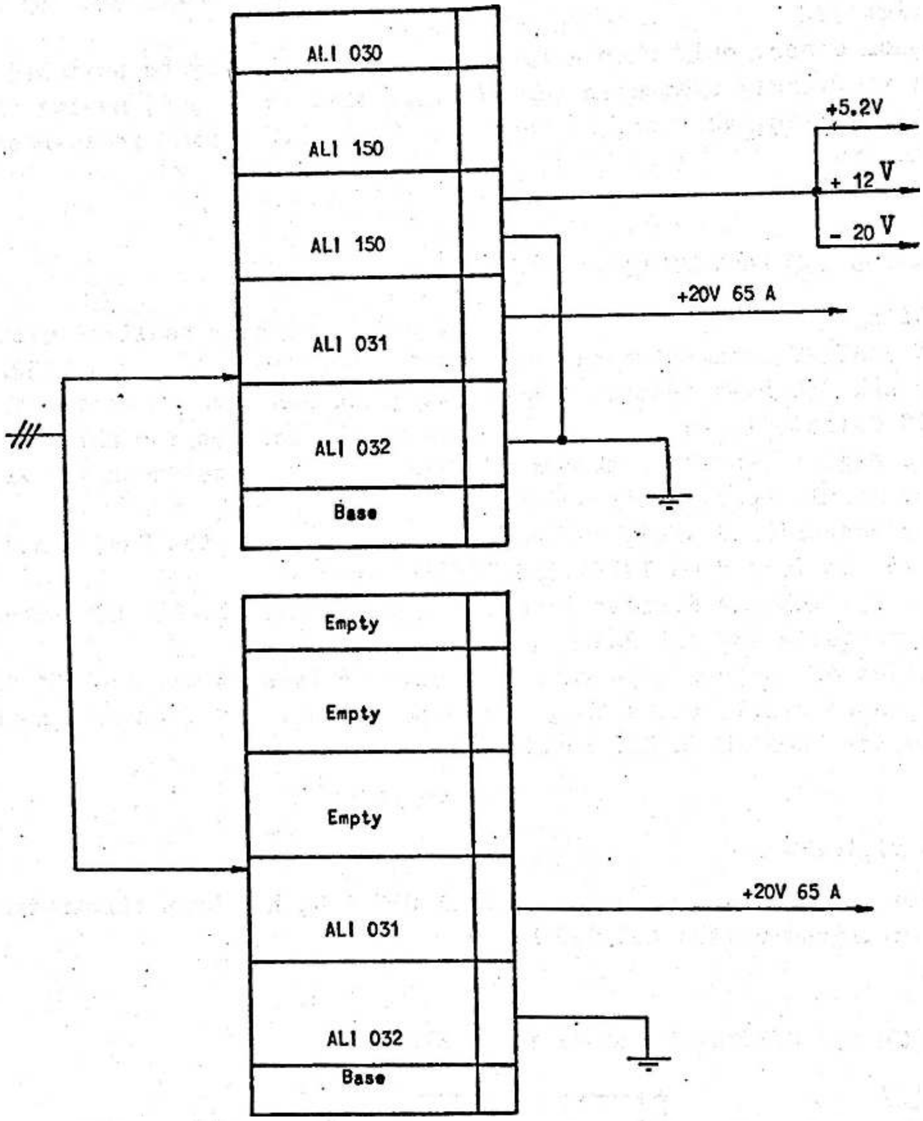


Fig. 7.4

With this configuration the voltages to be protected are 4 positive and 1 negative.
In such cases it is necessary to increase the current supplied by the Zener diode which issues the -10 V to the positive voltage dividers.
Such an operation is accomplished by linking J4 contacts 11-1 and 11-2

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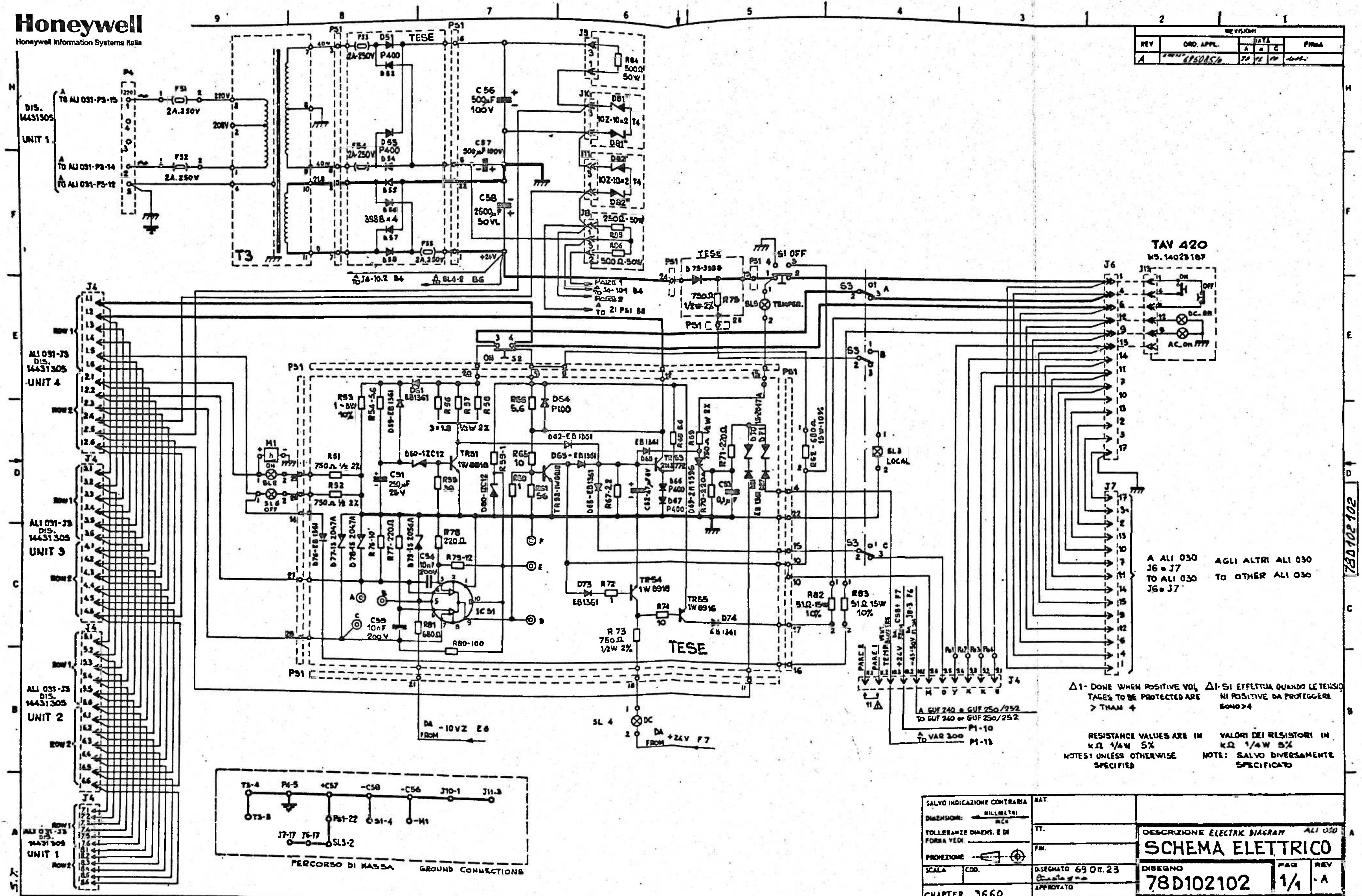
REVISIONI					
REV	ORD. APPL.	DATA A	DATA M	DATA G	FIRMA
A	6960856	70			



Δ1- DONE WHEN POSITIVE VOLTAGES TO BE PROTECTED ARE > THAN 4

Δ1- SI EFFETTUA QUANDO LE TENSIONI POSITIVE DA PROTEGGERE SONO >4

RESISTANCE VALUES ARE IN kΩ 1/4W 5%

NOTES: UNLESS OTHERWISE SPECIFIED

VALORI DEI RESISTORI IN kΩ 1/4W 5%

NOTE: SALVO DIVERSAMENTE SPECIFICATO

SALVO INDICAZIONE CONTRARIA DIMENSIONI: MILLIMETRI / INCH	MAT.	
TOLLERANZE DIMENS. E DI FORMA VEDI	TT.	DESCRIZIONE ELECTRIC DIAGRAM ALI 030 SCHEMA ELETTRICO
PROIEZIONE	FIN.	
SCALA	COD.	DISEGNATO 69 OH. 23	DISEGNO 78D102102
CHAPTER 3660	APPROVATO	PAG 1/1
	DISTR.	REV A

GE 130 — POWER SUPPLY

description

MAINTENANCE

1

GENERAL ELECTRIC
GENERAL ELECTRIC INFORMATION SYSTEMS ITALIA

GE 130

POWER SUPPLY SUBSYSTEM

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1. OPERATOR TASKS

2. MAINTENANCE CHECKS

ROUTINE : **2.1**

NAME : Electronic checks
DURATION :
PREREQUISITES : See note

NOTE

Do not attempt to carry out any electronic checks unless specifically called for in the troubleshooting Procedures of the GE 130 Power Supply.

3. CLEANING AND LUBRICATION

ROUTINE : **3.1**

NAME : Filter cleaning
DURATION :
PREREQUISITES : Equipment must be OFF

1 - TOOLS AND INSTRUMENTS

- Screwdriver, blade flat	P.N. 4355313 N
- Handle, universal	" 7138485 B
- Detergent, liquid household	"

2 - PURPOSE

- To restore efficiency to the fan filters.

3 - PRELIMINARY CHECKS

- Visually check that the filter has not sustained tears or holes. In this event, replace the filter.

4 - PROCEDURE

1) - Remove the fan housing panel from the wing.

2) - Remove the filter fixing screws and withdraw the filtering element.

3) - Clean the element by agitating it in a mild household detergent solution.

4) - Reverse blow the filters dry with a low pressure nozzle.

5) - Replace the filters, secure then with the screws previously removed and replace the wing panels.

5 - FINAL CHECKS

- None.

4. ADJUSTMENTS

ROUTINE : **4.1**

NAME : Electronic adjustments
DURATION : -
PREREQUISITES : See note

NOTE

Do not attemp to carry out any electronic checks unless specifically called for in the troubleshooting Procedures of the GE 130 Power Supply.

5. REMOVALS REPLACEMENTS

ROUTINE : 5.1

NAME : Removals and replacements
DURATION : -
PREREQUISITES : See note

NOTE

Removal and replacement Routines are described in the troubleshooting Procedures of the GE 130 Power Supply.

6. MAINTENANCE AIDS

WARNING

The troubleshooting Procedures are to be followed whenever the GE 130 Power Supply develops a fault.

2

PROCEDURE DI INTERVENTO ALIMENTATORE PER GE 130

GE 130 POWER SUPPLY INTERVENTION PROCEDURES

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IMPORTANTE

Gli schemi riportati in questo manuale sono puramente indicativi e pertanto non seguiranno l'evoluzione degli schemi di macchina.
Qualsiasi intervento deve prevedere come prima operazione il sezionamento del carico.

Tutte le misure di livelli devono essere eseguite con il tester e non con l'oscilloscopio.

Le routines seguenti (misure di forne d'onda non riferite a massa), 8-4-2, 12-2, 12-5, 13-6, 16-1-5, 17-4, possono essere eseguite solo scollegando la massa della tensione alternata di ingresso dell'oscilloscopio per evitare corto-circuiti sull'alimentatore.
In queste condizioni fare attenzione poichè la carcassa dell'oscilloscopio può risultare carica elettrostaticamente.

IMPORTANT

The diagrams given in this manual are purely indicative and therefore they will not be according to the machine diagrams.
Every intervention must plan as girst operation the sectioning of the load.

All the levels measures must be taken with the tester and not with the oscilloscope.

The gollowing routines (measure of wave forms not referred to ground), 8-4-2, 12-2, 12-5, 13-6, 16-1-5, 17-4, may be taken only disconnecting the ground of the a.c. voltage of input to the oscilloscope in order to avoid shortcircuits on the power supply.
In these conditions, be careful because the body of the oscolloscope may result electrostaticaly loaded.

1. GENERALITA'

Questo manuale vuol essere di guida al tecnico nella ricerca dei guasti sull'Alimentatore per GE 130.
Suggerisce una traccia da seguire che tiene conto in modo realistico delle probabilità di guasto. La ricerca viene indirizzata su quelle parti che per la specifica funzione nell'ambito della macchina, sono verosimilmente più soggette alla usura e al guasto.
Sono riportati numerosi disegni esplicativi, estratti dagli schemi di macchina, il cui scopo è di raccogliere su un unico documento tutti i componenti di un circuito (composto da elementi anche topograficamente distanti tra loro, ma che svolgono una precisa ed autonoma funzione logica).
Ogni schema è integrato da una tabella che riporta in ordine alfabetico e numerico i componenti costituenti il circuito, nonchè le informazioni, in forma molto concisa, necessarie alla comprensione del circuito stesso ed alla individuazione topografica dei componenti.
Per i circuiti elettronici sono presentati degli oscillogrammi rilevati in condizioni di normale funzionamento, mentre i punti più significativi dei circuiti sono corredati con indicazioni di tensioni misurate in condizioni normali.
Le numerose rappresentazioni topografiche impiegate consentono di stabilire una rapida relazione tra schema elettrico e disposizione pratica dei componenti.
Generalmente i componenti sono misurabili senza che occorra estrarli dal circuito; una notevole semplificazione nella ricerca del componente

1. GENERAL

This manual want to be a guide for the Field Engineer in the detection of failures on the GE 130 power supply.
It gives an out line to follow which considers in a realistic manner the failure probabilities. The research is directed towards those parts which for their specific function within the machine, are more liable to wear and failure.
Several explanatory drawings are here given taken from the machine diagrams and their scope is to collect on a single document all the circuit components (consisting of elements which may be topographically distant one from the other, but which perform a precise and independent logic function).
Every diagram is integrated with a table which gives in alphabetical and numerical order the components forming the circuit, and the information, in a very concise form, necessary for the understanding of the circuit itself and to the topographic location of the components.
Oscillograms taken in normal performance conditions are given for the electronic circuits, while the most significant points of the circuits are given with indications of voltages measured in normal conditions.
The large number of topographic diagrams used allow to establish a rapid relationship between electric diagram and pratical disposition of the components.
Generally the components may be tested without pulling them out of the circuit; a considerable help in the research of the faulty component is given by the repetitiveness of

guasto consegue alla ripetitività dei circuiti costituenti l'alimentatore. Infatti la possibilità di comparare i rilievi tra due circuiti che svolgono funzioni uguali (circuiti di pilotaggio dei diodi SCR, box tensioni ecc.) rende agevole la individuazione dell'avaria.

Nella valutazione dei guasti possibili sono stati esclusi tutti quei componenti elettrici (connettori, interruttori, lampade di segnalazione, fili di cablaggio, ecc.) la cui natura e la cui ubicazione rendono evidente la ricerca di una eventuale anomalia.

Lo stesso criterio selettivo è esteso a quei componenti (morsettiere , dissipatori, portafusibili, ecc.)che, con largo margine di sicurezza, si possono considerare non soggetti a guasti.

Sono inoltre trascurati tutti i problemi inerenti alla rete di alimentazione, le cui caratteristiche e prestazioni debbono rispettare le norme riportate nel manuale di preinstallazione.

Inoltre durante le fasi di intervento l'Alimentatore deve essere messo sotto tensione solo per il tempo richiesto dai controlli previsti dalle sequenze. Al termine di ogni intervento è necessario effettuare i controlli finali di cui alle pagg.80e90.

Dovendo procedere allo smontaggio di parti meccaniche, può essere utile riferirsi alle tavole del " Catalogo Parti di Ricambio" inserito nella documentazione di U.C., che riportano i particolari di montaggio in vista esplosa.

circuits in the power supply. In fact the possibility to compare the data of two circuits which perform the same function (circuits to drive SCR diodes, tension boxes, etc.) simplifies the detection of the fault.

In the evaluation of the possible failures, there are not all those electric components (connectors , switches, signal lamps, wiring leads, etc.) whose nature and location make the research of a possible fault evident. The same selective criteria has been extended to those components terminal boxes, dissipators, fuse holders, etc.) which, with a wide safety margin, can be considered as not being subject to failures.

We have neglected all the problems concerning the mains, whose characteristics and performances have to comply with pre-installation manual standards.

In addition, during the intervention phases, the power supply must be powered-on only for the time required by the sequence check. At the end of every intervention, it necessary to perform the final controls as per pages 80 and 90.

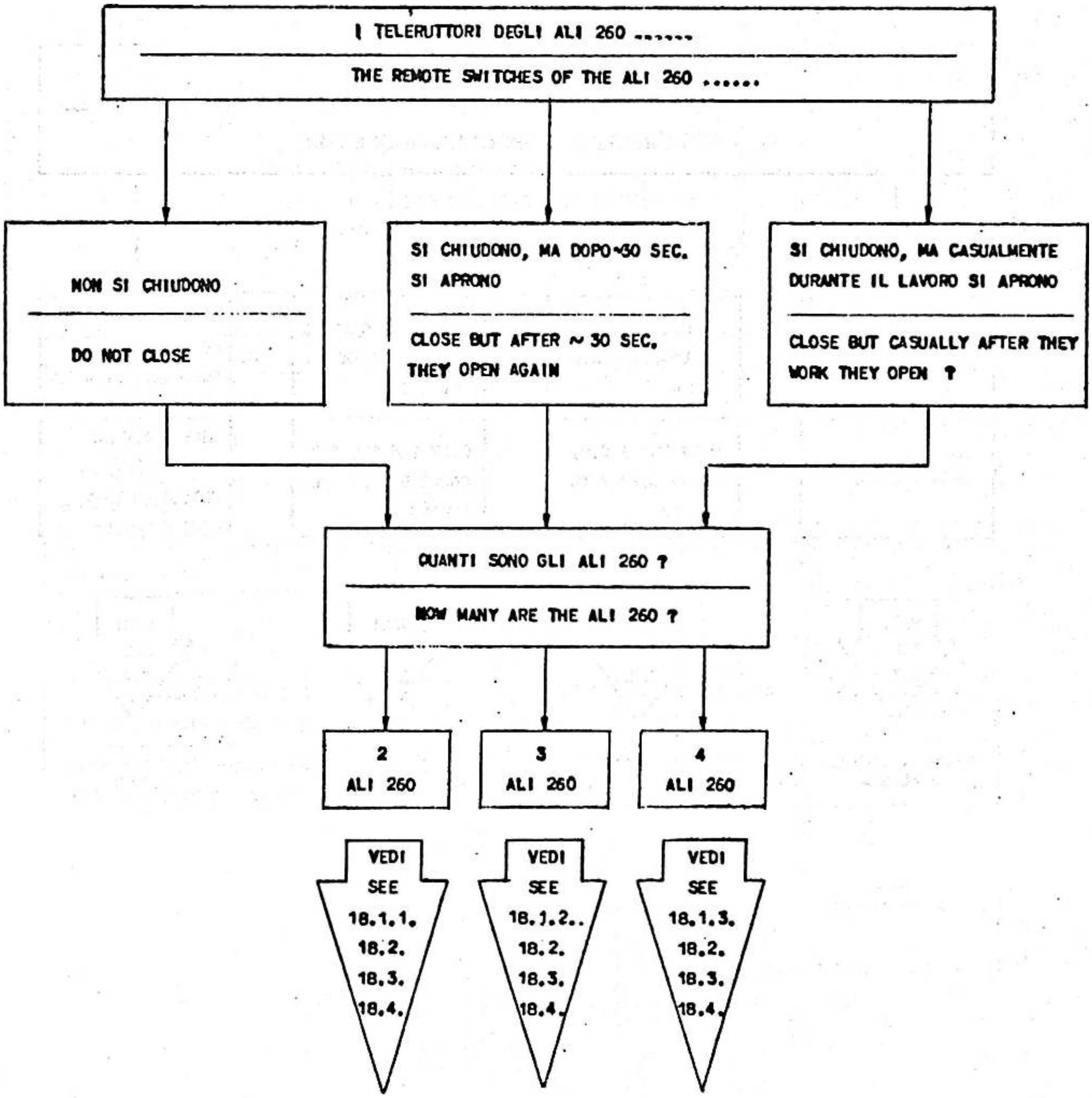
Should the mechanical parts be disassembled, it might be useful to refer to the "Spare Parts Catalog" added in the C. U. documentation, tables which give the assembly details in exploded view.

2. SINTOMATOLOGIA

2.1. Situazioni anomale riscontrabili con la premuta del tasto ACON

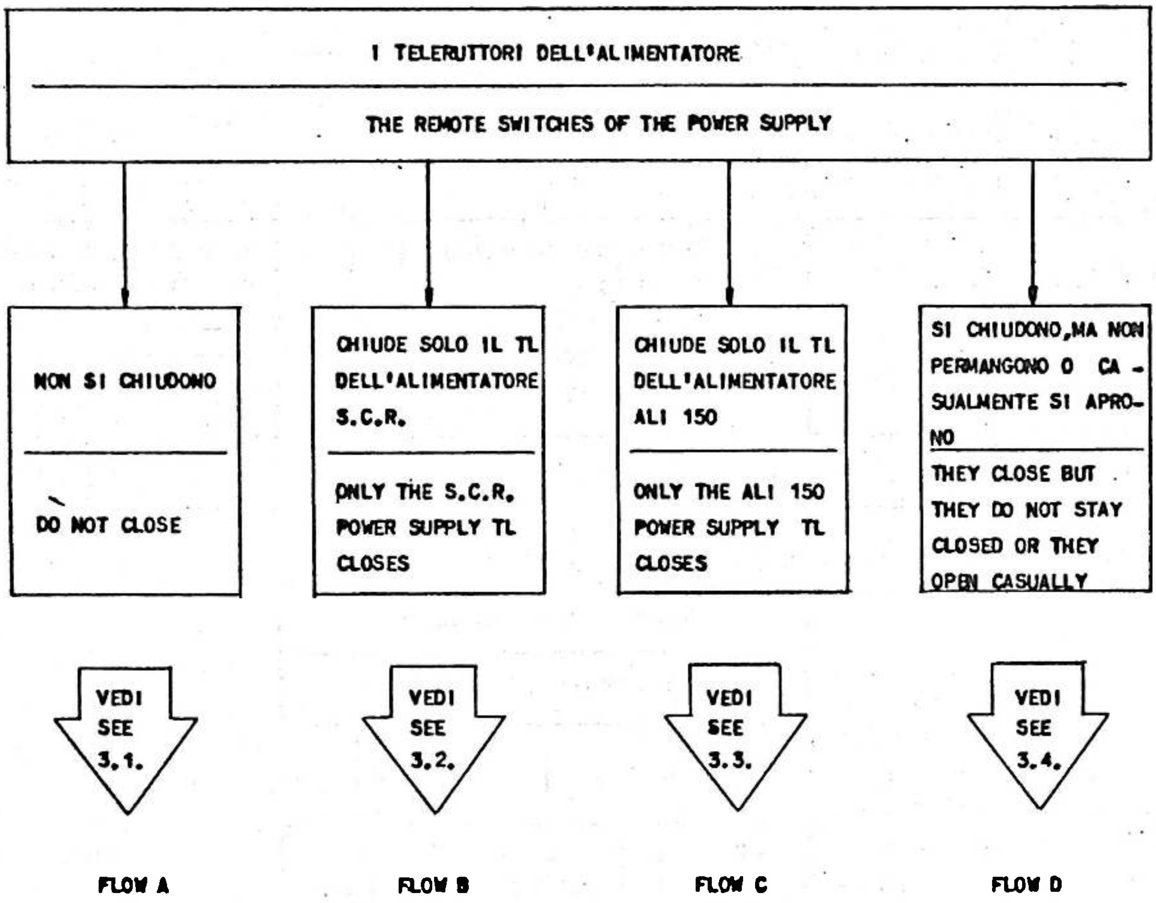
2. FAULT FLOW

2.1. Anomalous situations which can be detected pressing the ACON key.


I TELERUTTORI DEGLI ALI 260 ......
THE REMOTE SWITCHES OF THE ALI 260 ......
NON SI CHIUDONO
DO NOT CLOSE
SI CHIUDONO, MA DOPO ~30 SEC. SI APRONO
CLOSE BUT AFTER ~ 30 SEC. THEY OPEN AGAIN
SI CHIUDONO, MA CASUALMENTE DURANTE IL LAVORO SI APRONO
CLOSE BUT CASUALLY AFTER THEY WORK THEY OPEN ?
QUANTI SONO GLI ALI 260 ?
HOW MANY ARE THE ALI 260 ?
2 ALI 260
3 ALI 260
4 ALI 260
VEDI SEE 18.1.1. 18.2. 18.3. 18.4.
VEDI SEE 18.1.2. 18.2. 18.3. 18.4.
VEDI SEE 18.1.3. 18.2. 18.3. 18.4.

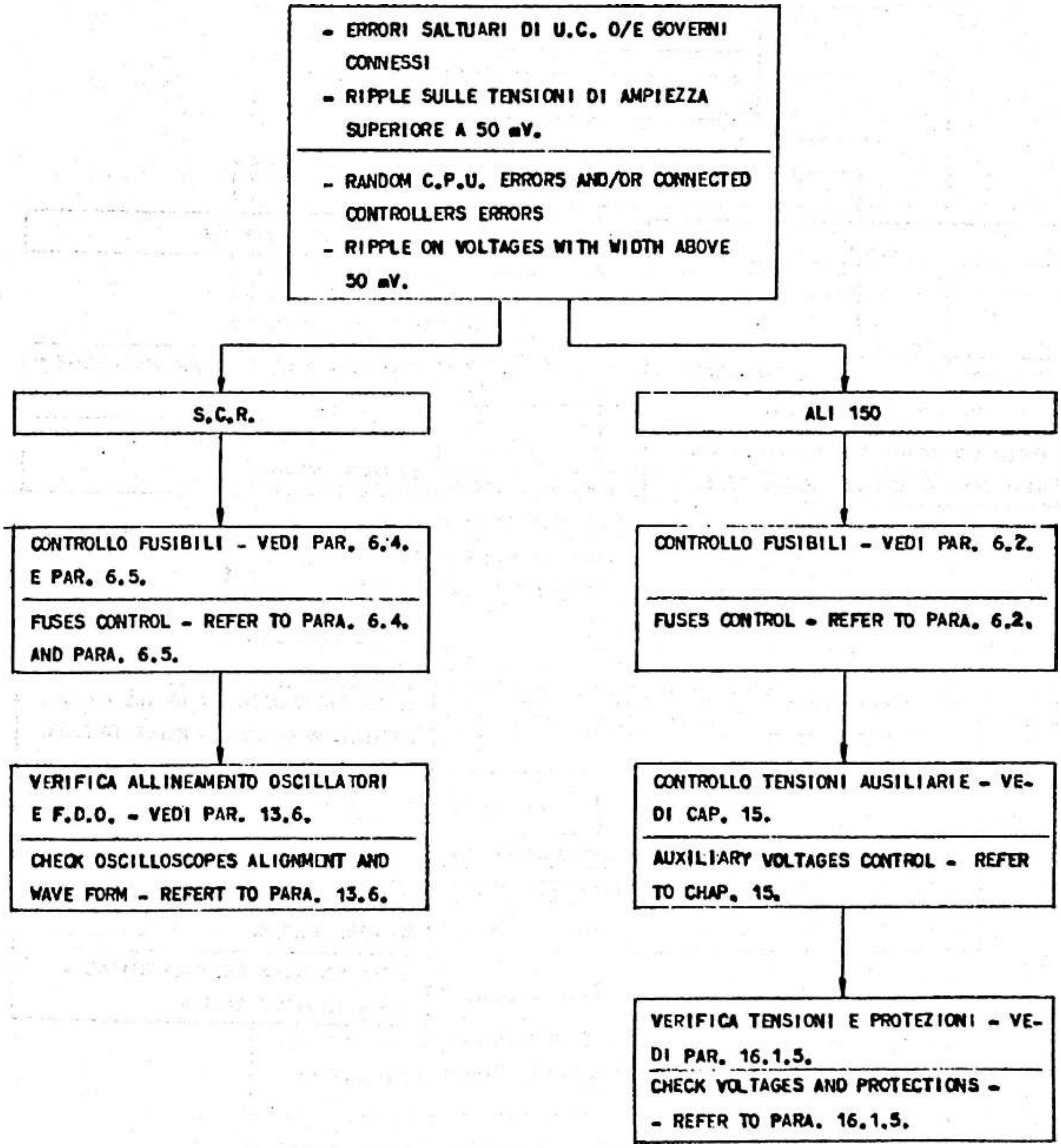
2.2. Situazioni anomale riscontrabili (con alternate presenti) con la premuta del tasto POWER ON

2.2 Anomalous situations which can be detected (in presence of A.C.) pressing the key POWER ON


I TELERUTTORI DELL'ALIMENTATORE
THE REMOTE SWITCHES OF THE POWER SUPPLY
NON SI CHIUDONO
DO NOT CLOSE
CHIUDE SOLO IL TL DELL'ALIMENTATORE S.C.R.
ONLY THE S.C.R. POWER SUPPLY TL CLOSES
CHIUDE SOLO IL TL DELL'ALIMENTATORE ALI 150
ONLY THE ALI 150 POWER SUPPLY TL CLOSES
SI CHIUDONO,MA NON PERMANGONO O CASUALMENTE SI APRONO
THEY CLOSE BUT THEY DO NOT STAY CLOSED OR THEY OPEN CASUALLY
VEDI SEE 3.1.
VEDI SEE 3.2.
VEDI SEE 3.3.
VEDI SEE 3.4.
FLOW A
FLOW B
FLOW C
FLOW D

2.3. Situazioni anomale riscontrabili durante il lavoro o nel corso di osservazioni oscilloscopiche di controllo (alternate e continue presenti).

2.3. Anomalous situations which can be detected during work or during the check oscilloscopic doservations (A.C. and D.C. present).



- ERRORI SALTUARI DI U.C. O/E GOVERNI CONNESSI
- RIPPLE SULLE TENSIONI DI AMPIEZZA SUPERIORE A 50 mV.

- RANDOM C.P.U. ERRORS AND/OR CONNECTED CONTROLLERS ERRORS
- RIPPLE ON VOLTAGES WITH WIDTH ABOVE 50 mV.

S.C.R.

CONTROLLO FUSIBILI - VEDI PAR. 6.4. E PAR. 6.5.

FUSES CONTROL - REFER TO PARA. 6.4. AND PARA. 6.5.

VERIFICA ALLINEAMENTO OSCILLATORI E F.D.O. - VEDI PAR. 13.6.

CHECK OSCILLOSCOPES ALIGNMENT AND WAVE FORM - REFERT TO PARA. 13.6.

ALI 150

CONTROLLO FUSIBILI - VEDI PAR. 6.2.

FUSES CONTROL - REFER TO PARA. 6.2.

CONTROLLO TENSIONI AUSILIARIE - VEDI CAP. 15.

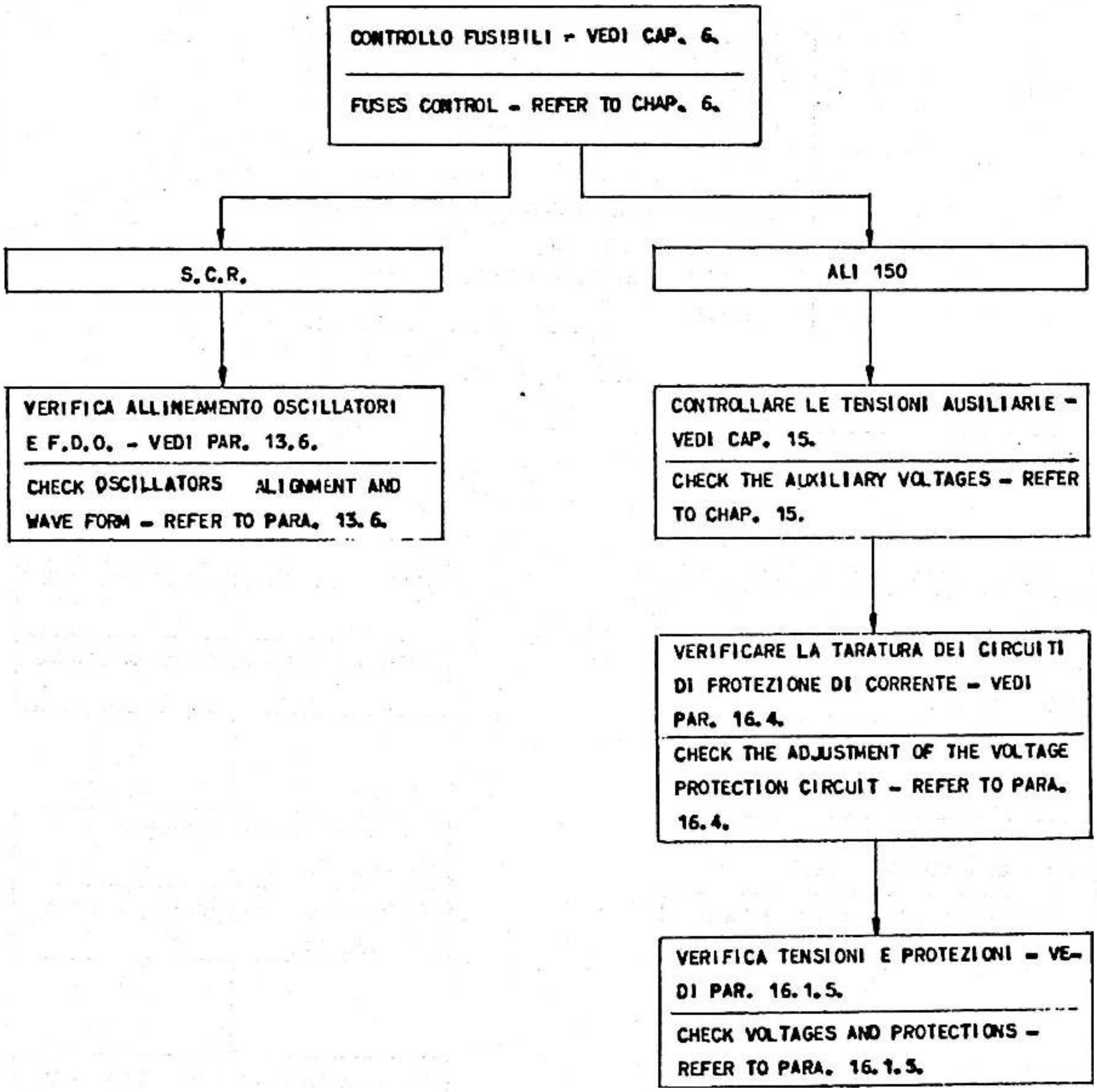
AUXILIARY VOLTAGES CONTROL - REFER TO CHAP. 15.

VERIFICA TENSIONI E PROTEZIONI - VEDI PAR. 16.1.5.

CHECK VOLTAGES AND PROTECTIONS - - REFER TO PARA. 16.1.5.

2.4. L'alimentatore scollegato funziona regolarmente ma con il carico di macchina non si mantiene. Una o più tensioni si scostano dal valore nominale

2.4. The power supply disconnected works regularly, but with a machine load it does no keep a regular voltage. One or more voltages are different from the nominal value



CONTROLLO FUSIBILI - VEDI CAP. 6.

FUSES CONTROL - REFER TO CHAP. 6.

S.C.R.

VERIFICA ALLINEAMENTO OSCILLATORI E F.D.O. - VEDI PAR. 13.6.

CHECK OSCILLATORS ALIGNMENT AND WAVE FORM - REFER TO PARA. 13.6.

ALI 150

CONTROLLARE LE TENSIONI AUSILIARIE - VEDI CAP. 15.

CHECK THE AUXILIARY VOLTAGES - REFER TO CHAP. 15.

VERIFICARE LA TARATURA DEI CIRCUITI DI FROTEZIONE DI CORRENTE - VEDI PAR. 16.4.

CHECK THE ADJUSTMENT OF THE VOLTAGE PROTECTION CIRCUIT - REFER TO PARA. 16.4.

VERIFICA TENSIONI E PROTEZIONI - VEDI PAR. 16.1.5.

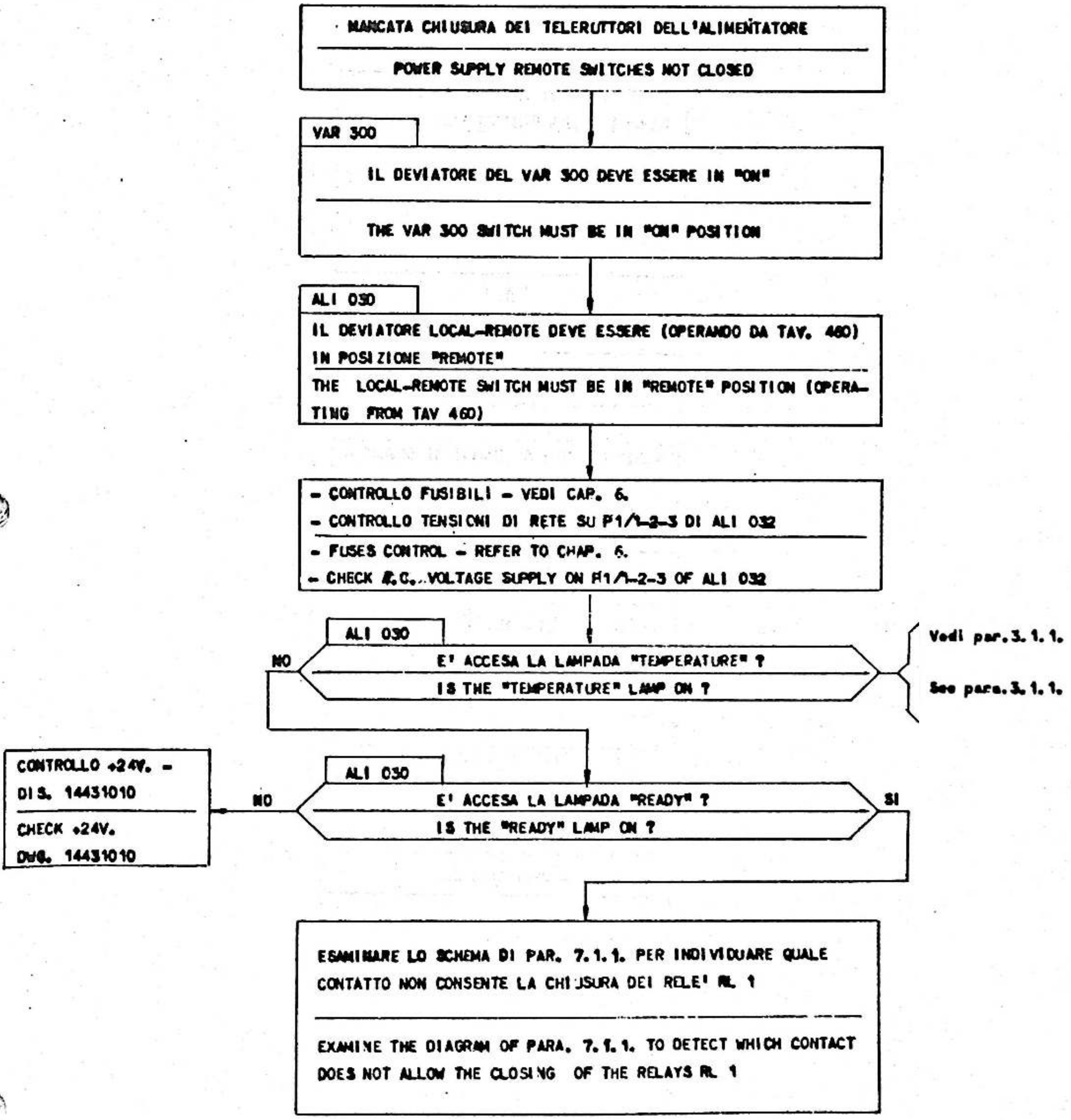
CHECK VOLTAGES AND PROTECTIONS - REFER TO PARA. 16.1.5.

3. FLOW

3. FLOW

3.1. Flow A

3.1. Flow A



MANCATA CHIUSURA DEI TELERUTTORI DELL'ALIMENTATORE

POWER SUPPLY REMOTE SWITCHES NOT CLOSED

IL DEVIATORE DEL VAR 300 DEVE ESSERE IN "ON"

THE VAR 300 SWITCH MUST BE IN "ON" POSITION

IL DEVIATORE LOCAL-REMOTE DEVE ESSERE (OPERANDO DA TAV. 460) IN POSIZIONE "REMOTE"

THE LOCAL-REMOTE SWITCH MUST BE IN "REMOTE" POSITION (OPERATING FROM TAV 460)

- CONTROLLO FUSIBILI - VEDI CAP. 6.
- CONTROLLO TENSIONI DI RETE SU P1/1-2-3 DI ALI 032

- FUSES CONTROL - REFER TO CHAP. 6.
- CHECK A.C. VOLTAGE SUPPLY ON P1/1-2-3 OF ALI 032

E' ACCESA LA LAMPADA "TEMPERATURE" ?

IS THE "TEMPERATURE" LAMP ON ?

Vedi par. 3.1.1.

See para. 3.1.1.

E' ACCESA LA LAMPADA "READY" ?

IS THE "READY" LAMP ON ?

CONTROLLO +24V. - DIS. 14431010

CHECK +24V. DWG. 14431010

ESAMINARE LO SCHEMA DI PAR. 7.1.1. PER INDIVIDUARE QUALE CONTATTO NON CONSENTE LA CHIUSURA DEI RELE' RL 1

EXAMINE THE DIAGRAM OF PARA. 7.1.1. TO DETECT WHICH CONTACT DOES NOT ALLOW THE CLOSING OF THE RELAYS RL 1

3.1.1. Anomalie per sovratemperatura

3.1.1. Overtemperature faults

CONTROLLARE SU QUALE PACCO E' ACCESA LA LAMPADA "TEMPERATURA":ALI031 SCR O PACCO TRASFORMATORI ALI 150

CHECK ON WHICH MODULE THE "TEMPERATURE" LAMP IS LIT - SCR ALI 031 OR ALI 150 TANSFER PACKAGE

CONTROLLARE LA EFFICIENZA DEI VENTILATORI E LA PULIZIA DEI FILTRI SU ALI 032 - ALI 031 - ALI 150 E ACCERTARSI CHE NON SI TRATTI DI SOVRACCARICO (VEDI TABELLA ASSORBIMENTI AL CAP. 22)

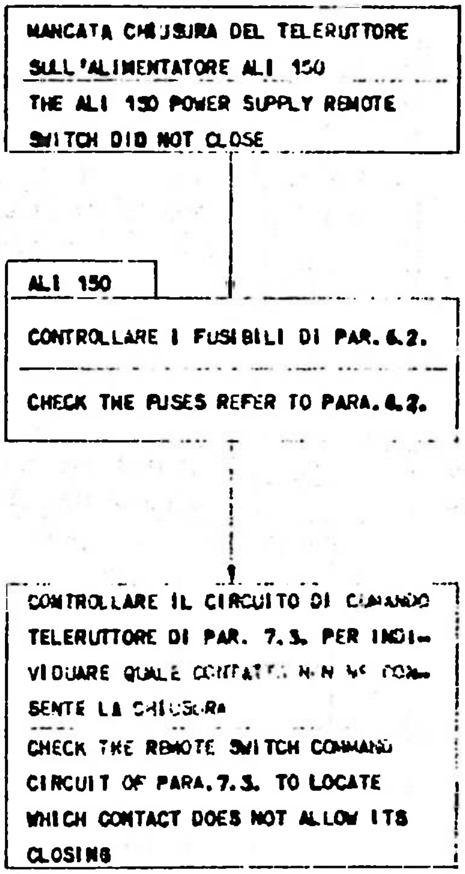
CHECK THE EFFICIENCY OF THE BLOWERS AND THE FILTERS CLEANING ON THE ALI 032 - ALI 031 - ALI 150 - MAKE SURE THAT THERE IS NOT AN OVERLOAD (REFER TO ABSORPTIONS TABLE ON CHAP. 22)

ESAMINARE IL CIRCUITO DI SOVRATEMPERATURA - VEDI CAP. 8.

EXAMINE THE OVERTEMPERATURE CIRCUIT - REFER TO CHAP. 8.

3.2. Flow B

3.2. Flow B



MANCATA CHIUSURA DEL TELERUTTORE SULL'ALIMENTATORE ALI 150

THE ALI 150 POWER SUPPLY REMOTE SWITCH DID NOT CLOSE

ALI 150

CONTROLLARE I FUSIBILI DI PAR. 6.2.

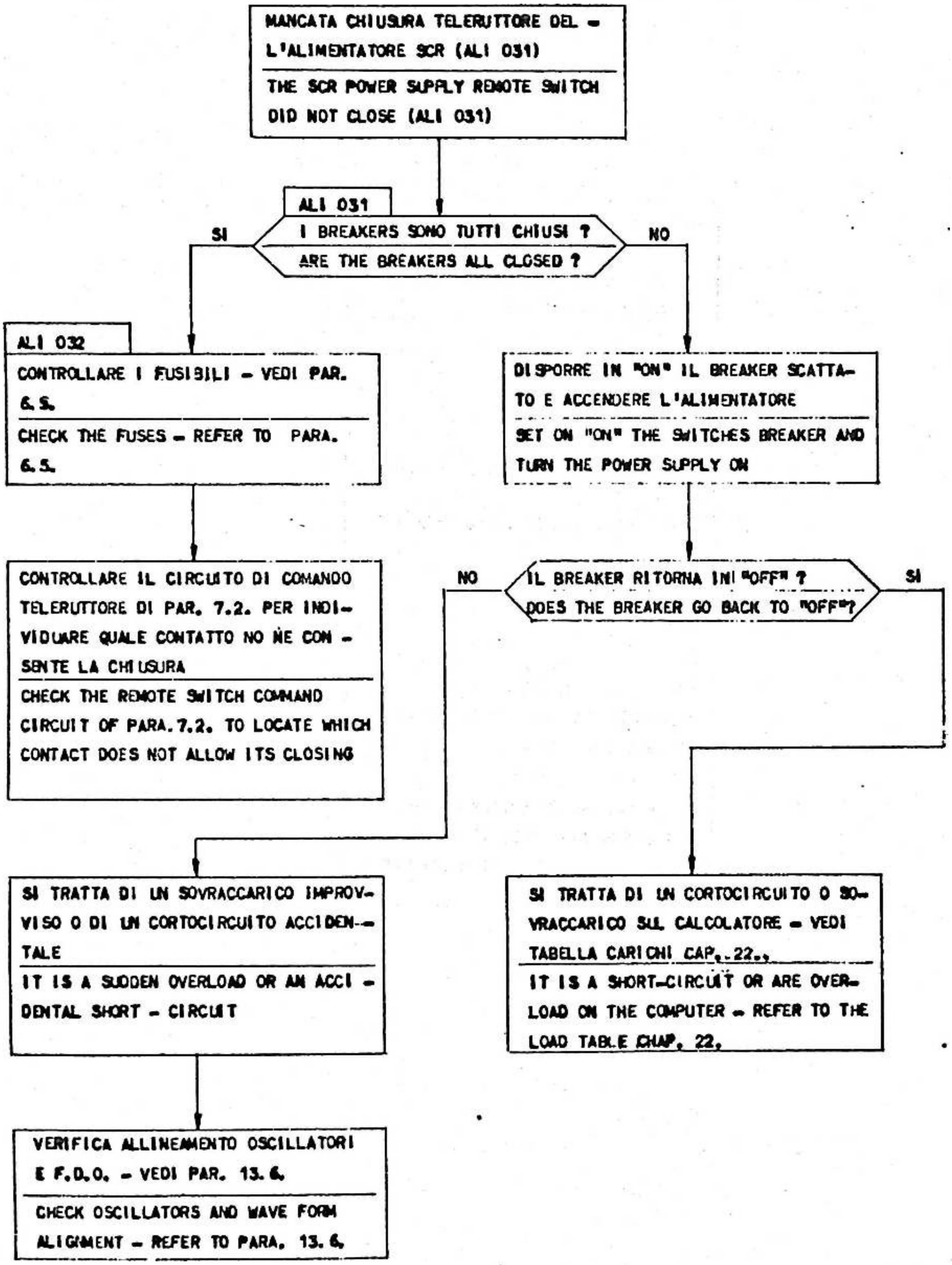
CHECK THE FUSES REFER TO PARA. 6.2.

CONTROLLARE IL CIRCUITO DI COMANDO TELERUTTORE DI PAR. 7.3. PER INDIVIDUARE QUALE CONTATTO NON NE CONSENTE LA CHIUSURA

CHECK THE REMOTE SWITCH COMMAND CIRCUIT OF PARA. 7.3. TO LOCATE WHICH CONTACT DOES NOT ALLOW ITS CLOSING

3.3. Flow C

3.3. Flow C



MANCATA CHIUSURA TELERUTTORE DELL'ALIMENTATORE SCR (ALI 031)

THE SCR POWER SUPPLY REMOTE SWITCH DID NOT CLOSE (ALI 031)

ALI 031

I BREAKERS SONO TUTTI CHIUSI ?

ARE THE BREAKERS ALL CLOSED ?

ALI 032

CONTROLLARE I FUSIBILI - VEDI PAR. 6.5.

CHECK THE FUSES - REFER TO PARA. 6.5.

CONTROLLARE IL CIRCUITO DI COMANDO TELERUTTORE DI PAR. 7.2. PER INDIVIDUARE QUALE CONTATTO NO NE CONSENTE LA CHIUSURA

CHECK THE REMOTE SWITCH COMMAND CIRCUIT OF PARA. 7.2. TO LOCATE WHICH CONTACT DOES NOT ALLOW ITS CLOSING

DISPORRE IN "ON" IL BREAKER SCATTATO E ACCENDERE L'ALIMENTATORE

SET ON "ON" THE SWITCHES BREAKER AND TURN THE POWER SUPPLY ON

IL BREAKER RITORNA IN "OFF" ?

DOES THE BREAKER GO BACK TO "OFF"?

SI TRATTA DI UN SOVRACCARICO IMPROVVISO O DI UN CORTOCIRCUITO ACCIDENTALE

IT IS A SUDDEN OVERLOAD OR AN ACCIDENTAL SHORT - CIRCUIT

SI TRATTA DI UN CORTOCIRCUITO O SOVRACCARICO SUL CALCOLATORE - VEDI TABELLA CARICHI CAP. 22.

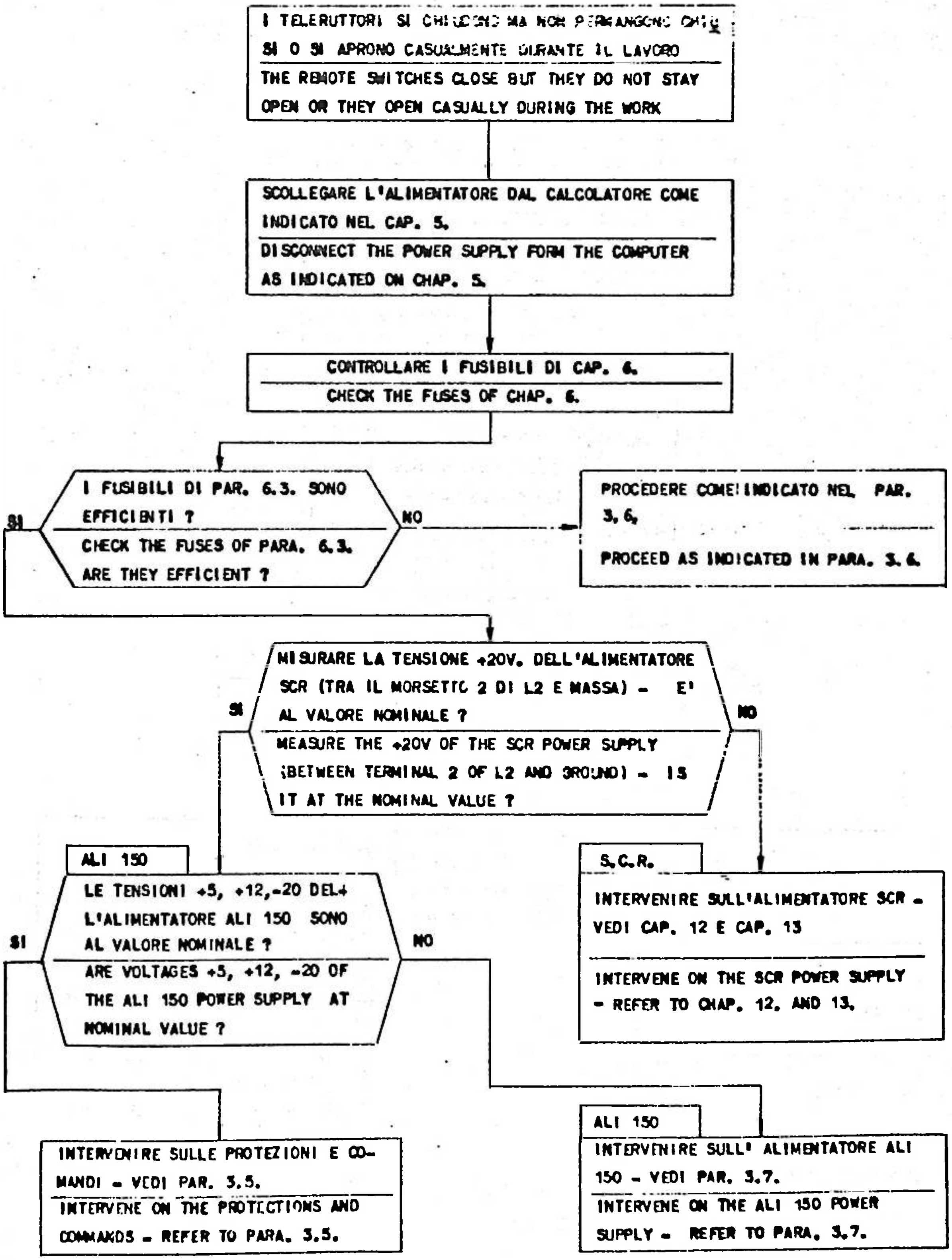
IT IS A SHORT-CIRCUIT OR ARE OVERLOAD ON THE COMPUTER - REFER TO THE LOAD TABLE CHAP. 22.

VERIFICA ALLINEAMENTO OSCILLATORI E F.D.O. - VEDI PAR. 13.6.

CHECK OSCILLATORS AND WAVE FORM ALIGNMENT - REFER TO PARA. 13.6.

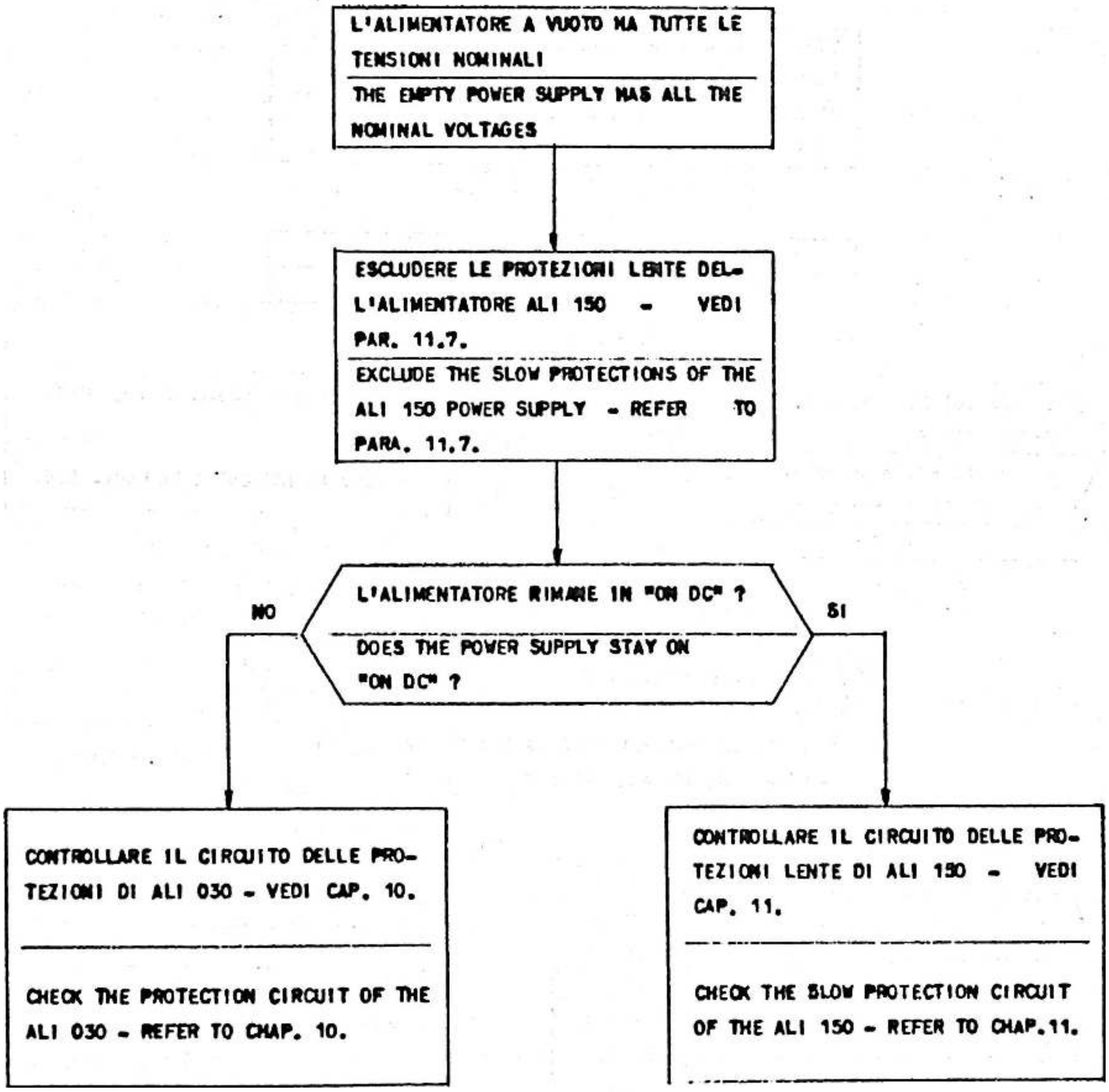
3.4. Flow D

3.4. Flow D


I TELERUTTORI SI CHIUDONO MA NON PERMANGONO CHIUSI O SI APRONO CASUALMENTE DURANTE IL LAVORO
THE REMOTE SWITCHES CLOSE BUT THEY DO NOT STAY OPEN OR THEY OPEN CASUALLY DURING THE WORK
SCOLLEGARE L'ALIMENTATORE DAL CALCOLATORE COME INDICATO NEL CAP. 5.
DISCONNECT THE POWER SUPPLY FORM THE COMPUTER AS INDICATED ON CHAP. 5.
CONTROLLARE I FUSIBILI DI CAP. 6.
CHECK THE FUSES OF CHAP. 6.
I FUSIBILI DI PAR. 6.3. SONO EFFICIENTI ?
CHECK THE FUSES OF PARA. 6.3. ARE THEY EFFICIENT ?
SI
NO
PROCEDERE COME INDICATO NEL PAR. 3.6.
PROCEED AS INDICATED IN PARA. 3.6.
MISURARE LA TENSIONE +20V. DELL'ALIMENTATORE SCR (TRA IL MORSETTO 2 DI L2 E MASSA) - E' AL VALORE NOMINALE ?
MEASURE THE +20V OF THE SCR POWER SUPPLY (BETWEEN TERMINAL 2 OF L2 AND GROUND) - IS IT AT THE NOMINAL VALUE ?
SI
NO
ALI 150
LE TENSIONI +5, +12,-20 DELL'ALIMENTATORE ALI 150 SONO AL VALORE NOMINALE ?
ARE VOLTAGES +5, +12, -20 OF THE ALI 150 POWER SUPPLY AT NOMINAL VALUE ?
SI
NO
S.C.R.
INTERVENIRE SULL'ALIMENTATORE SCR - VEDI CAP. 12 E CAP. 13
INTERVENE ON THE SCR POWER SUPPLY - REFER TO CHAP. 12. AND 13.
INTERVENIRE SULLE PROTEZIONI E COMANDI - VEDI PAR. 3.5.
INTERVENE ON THE PROTECTIONS AND COMMANDS - REFER TO PARA. 3.5.
ALI 150
INTERVENIRE SULL' ALIMENTATORE ALI 150 - VEDI PAR. 3.7.
INTERVENE ON THE ALI 150 POWER SUPPLY - REFER TO PARA. 3.7.

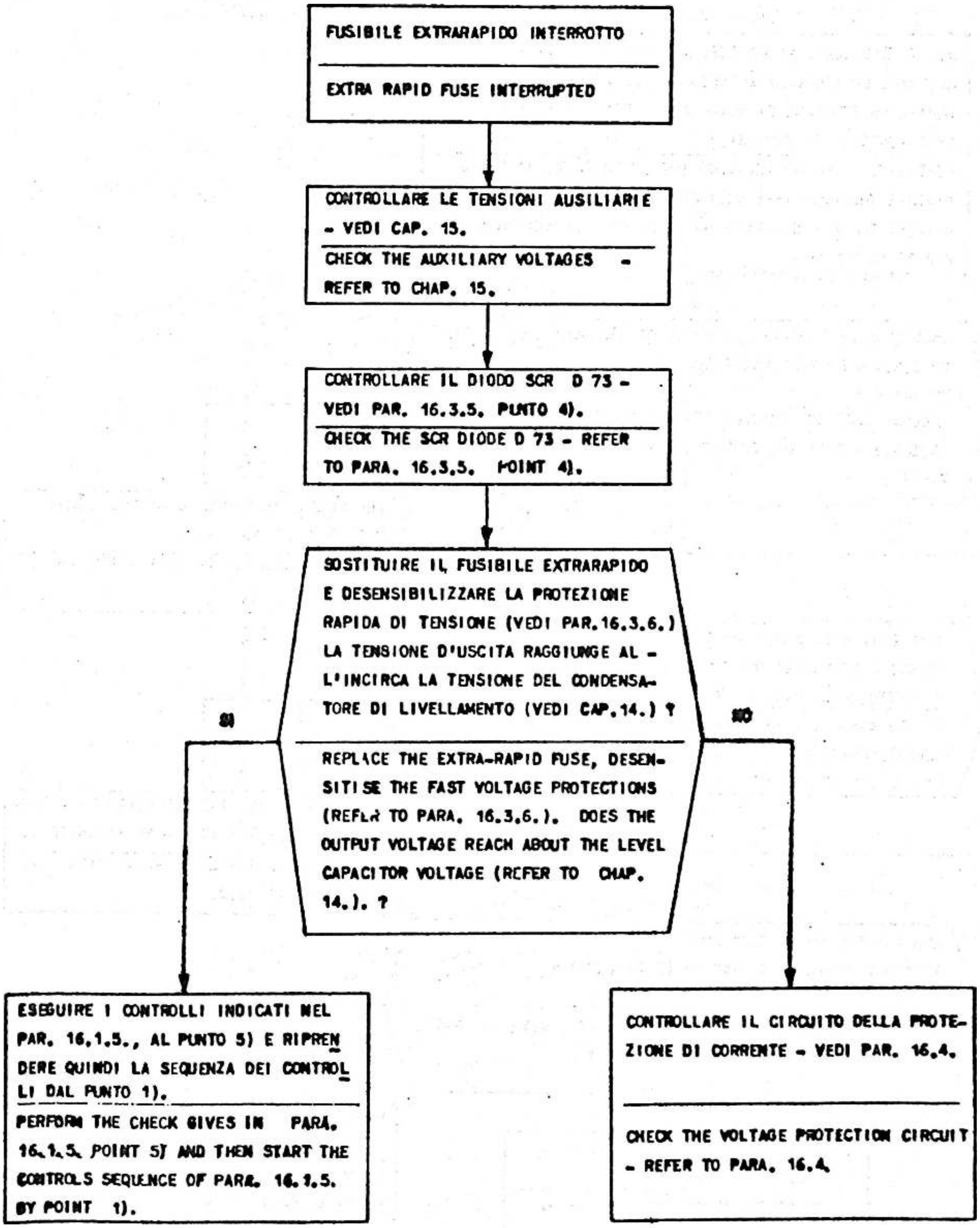
3.5. Indirizzamento intervento per anomalie sui circuiti delle protezioni.

3.5. Addressing of intervention for anomalous situations on the protection circuits.


L'ALIMENTATORE A VUOTO HA TUTTE LE TENSIONI NOMINALI
THE EMPTY POWER SUPPLY HAS ALL THE NOMINAL VOLTAGES
ESCLUDERE LE PROTEZIONI LENTE DELL'ALIMENTATORE ALI 150 - VEDI PAR. 11.7.
EXCLUDE THE SLOW PROTECTIONS OF THE ALI 150 POWER SUPPLY - REFER TO PARA. 11.7.
L'ALIMENTATORE RIMANE IN "ON DC" ?
DOES THE POWER SUPPLY STAY ON "ON DC" ?
NO
SI
CONTROLLARE IL CIRCUITO DELLE PROTEZIONI DI ALI 030 - VEDI CAP. 10.
CHECK THE PROTECTION CIRCUIT OF THE ALI 030 - REFER TO CHAP. 10.
CONTROLLARE IL CIRCUITO DELLE PROTEZIONI LENTE DI ALI 150 - VEDI CAP. 11.
CHECK THE SLOW PROTECTION CIRCUIT OF THE ALI 150 - REFER TO CHAP.11.

3.6. Indirizzamento intervento per anomalie sui fusibili extrarapidi di ALI 150.

3.6. General lines of intervention for anomalous behavior of extra rapid fuses of ALI 150.



FUSIBILE EXTRARAPIDO INTERROTTO

EXTRA RAPID FUSE INTERRUPTED

CONTROLLARE LE TENSIONI AUSILIARIE - VEDI CAP. 15.

CHECK THE AUXILIARY VOLTAGES - REFER TO CHAP. 15.

CONTROLLARE IL DIODO SCR D 73 - VEDI PAR. 16.3.5. PUNTO 4).

CHECK THE SCR DIODE D 73 - REFER TO PARA. 16.3.5. POINT 4).

SOSTITUIRE IL FUSIBILE EXTRARAPIDO E DESENSIBILIZZARE LA PROTEZIONE RAPIDA DI TENSIONE (VEDI PAR.16.3.6.) LA TENSIONE D'USCITA RAGGIUNGE ALL'INCIRCA LA TENSIONE DEL CONDENSATORE DI LIVELLAMENTO (VEDI CAP.14.) ?

REPLACE THE EXTRA-RAPID FUSE, DESENSITISE THE FAST VOLTAGE PROTECTIONS (REFER TO PARA. 16.3.6.). DOES THE OUTPUT VOLTAGE REACH ABOUT THE LEVEL CAPACITOR VOLTAGE (REFER TO CHAP. 14.). ?

ESEGUIRE I CONTROLLI INDICATI NEL PAR. 16.1.5., AL PUNTO 5) E RIPRENDERE QUINDI LA SEQUENZA DEI CONTROLLI DAL PUNTO 1).

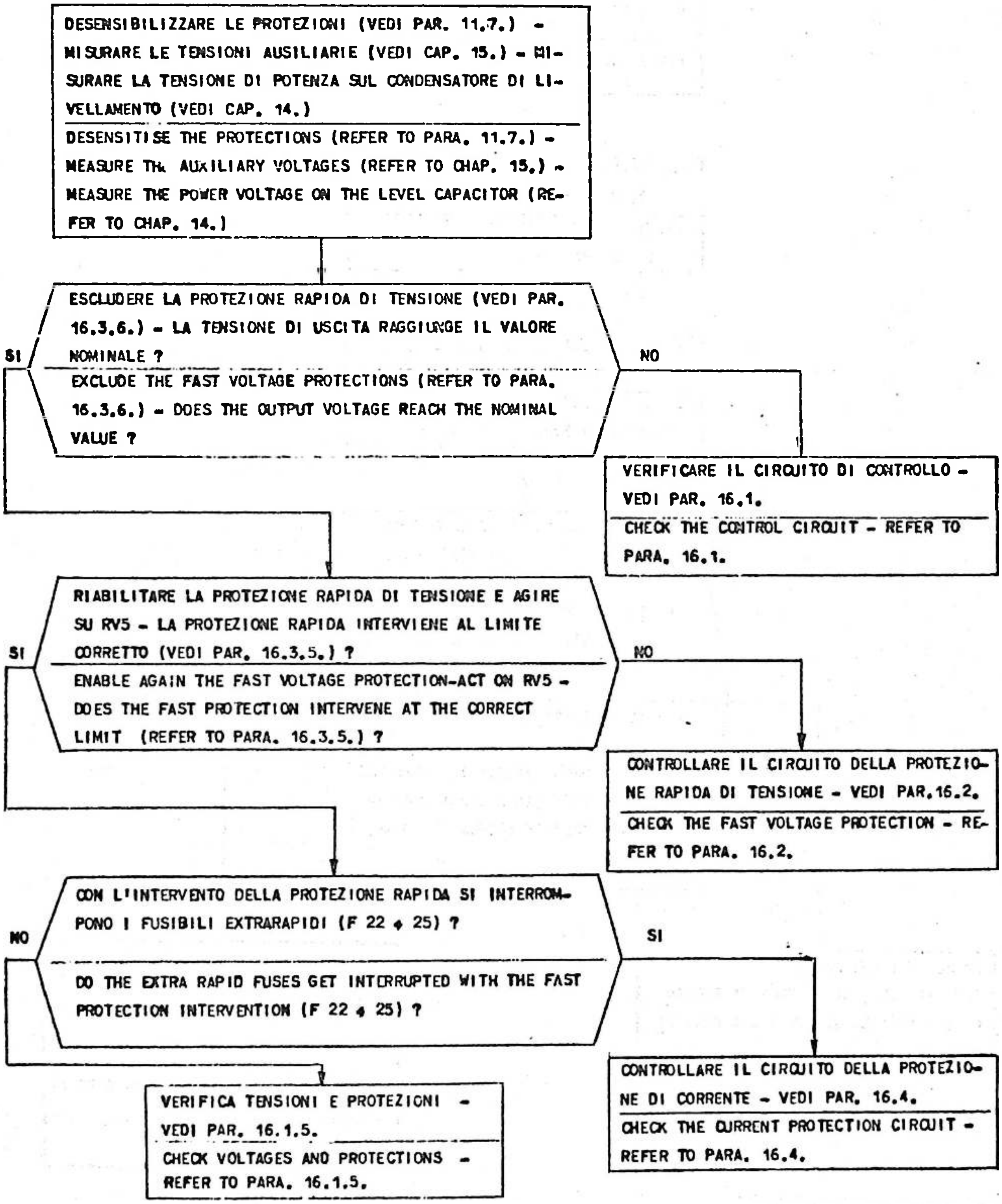
PERFORM THE CHECK GIVES IN PARA. 16.1.5. POINT 5) AND THEN START THE CONTROLS SEQUENCE OF PARA. 16.1.5. BY POINT 1).

CONTROLLARE IL CIRCUITO DELLA PROTEZIONE DI CORRENTE - VEDI PAR. 16.4.

CHECK THE VOLTAGE PROTECTION CIRCUIT - REFER TO PARA. 16.4.

3.7. Indirizzamento intervento per anomalie su una o più tensioni dell'alimentatore ALI 150.

3.7. Addressing of intervention for anomalous conditions on one or more voltages of the ALI 150 power supply.



DESENSIBILIZZARE LE PROTEZIONI (VEDI PAR. 11.7.) - MISURARE LE TENSIONI AUSILIARIE (VEDI CAP. 15.) - MISURARE LA TENSIONE DI POTENZA SUL CONDENSATORE DI LIVELLAMENTO (VEDI CAP. 14.)

DESENSITISE THE PROTECTIONS (REFER TO PARA. 11.7.) - MEASURE THE AUXILIARY VOLTAGES (REFER TO CHAP. 15.) - MEASURE THE POWER VOLTAGE ON THE LEVEL CAPACITOR (REFER TO CHAP. 14.)

ESCLUDERE LA PROTEZIONE RAPIDA DI TENSIONE (VEDI PAR. 16.3.6.) - LA TENSIONE DI USCITA RAGGIUNGE IL VALORE NOMINALE ?

EXCLUDE THE FAST VOLTAGE PROTECTIONS (REFER TO PARA. 16.3.6.) - DOES THE OUTPUT VOLTAGE REACH THE NOMINAL VALUE ?

VERIFICARE IL CIRCUITO DI CONTROLLO - VEDI PAR. 16.1.

CHECK THE CONTROL CIRCUIT - REFER TO PARA. 16.1.

RIABILITARE LA PROTEZIONE RAPIDA DI TENSIONE E AGIRE SU RV5 - LA PROTEZIONE RAPIDA INTERVIENE AL LIMITE CORRETTO (VEDI PAR. 16.3.5.) ?

ENABLE AGAIN THE FAST VOLTAGE PROTECTION-ACT ON RV5 - DOES THE FAST PROTECTION INTERVENE AT THE CORRECT LIMIT (REFER TO PARA. 16.3.5.) ?

CONTROLLARE IL CIRCUITO DELLA PROTEZIONE RAPIDA DI TENSIONE - VEDI PAR.16.2.

CHECK THE FAST VOLTAGE PROTECTION - REFER TO PARA. 16.2.

CON L'INTERVENTO DELLA PROTEZIONE RAPIDA SI INTERROMPONO I FUSIBILI EXTRARAPIDI (F 22 ÷ 25) ?

DO THE EXTRA RAPID FUSES GET INTERRUPTED WITH THE FAST PROTECTION INTERVENTION (F 22 ÷ 25) ?

CONTROLLARE IL CIRCUITO DELLA PROTEZIONE DI CORRENTE - VEDI PAR. 16.4.

CHECK THE CURRENT PROTECTION CIRCUIT - REFER TO PARA. 16.4.

VERIFICA TENSIONI E PROTEZIONI - VEDI PAR. 16.1.5.

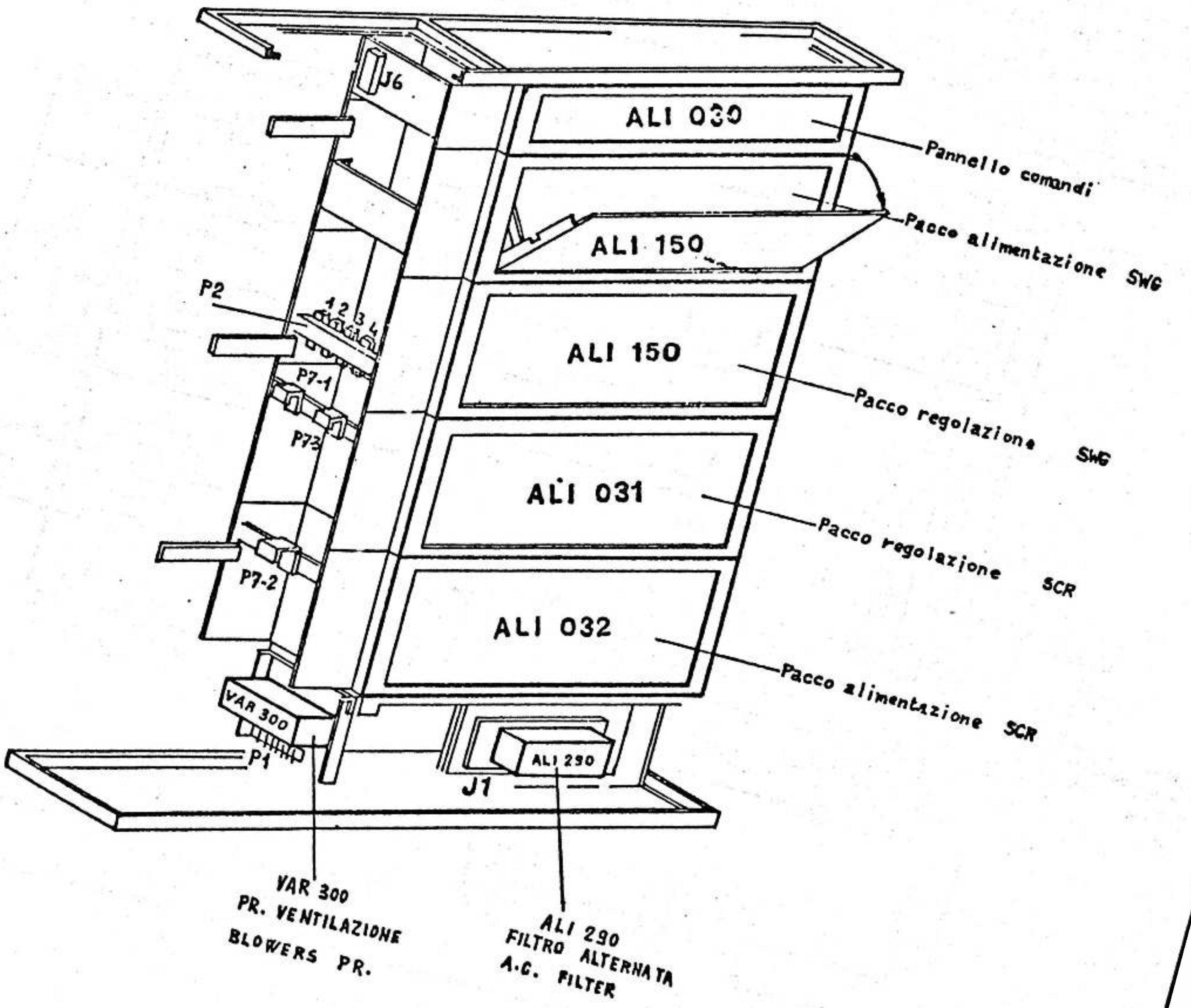
CHECK VOLTAGES AND PROTECTIONS - REFER TO PARA. 16.1.5.

4. ALA ALIMENTAZIONE

4.1. Disposizione topografica delle unità di alimentazione.

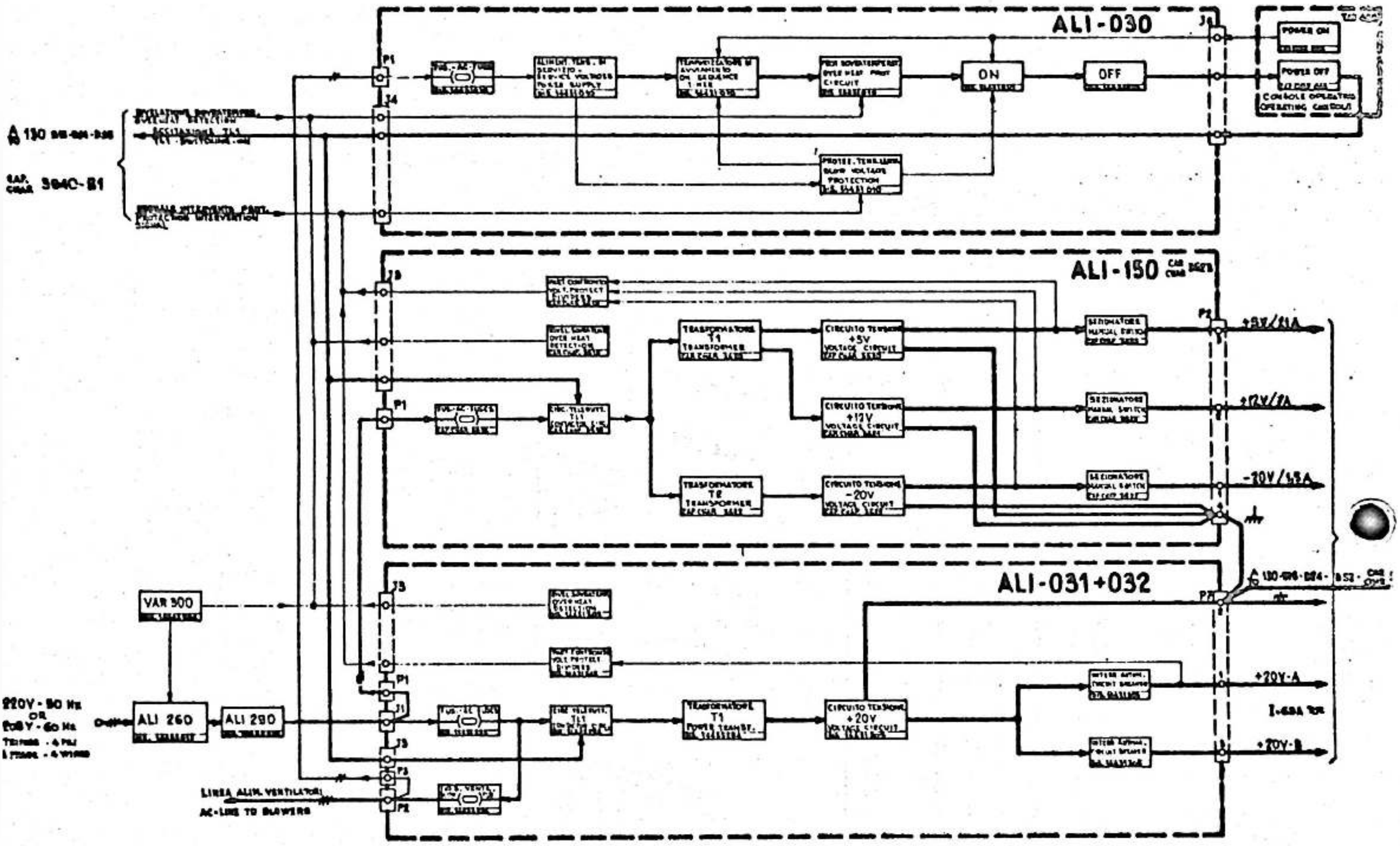
4. POWER SUPPLY WING

4.1. Topographic disposition of the power supply units.



4.2. Schema di principio a blocchi dell'alimentatore.

4.2. General block diagram of the power supply.



5. SCONNESSIONE DELL'ALIMENTATORE DAL CALCOLATORE

5.1. ALI 150

Portare i sezionatori S1-S2-S3-S4 nella posizione 2.

L'alimentatore risulta così collegato ai carichi interni (resistenze zavorra).

I quattro sezionatori debbono sempre essere tutti nella medesima posizione:

POS. 2 - CARICO INTERNO

POS. 3 - CARICO DI MACCHINA

5. DISCONNECTION OF THE POWER SUPPLY FROM THE COMPUTER

5.1. ALI 150

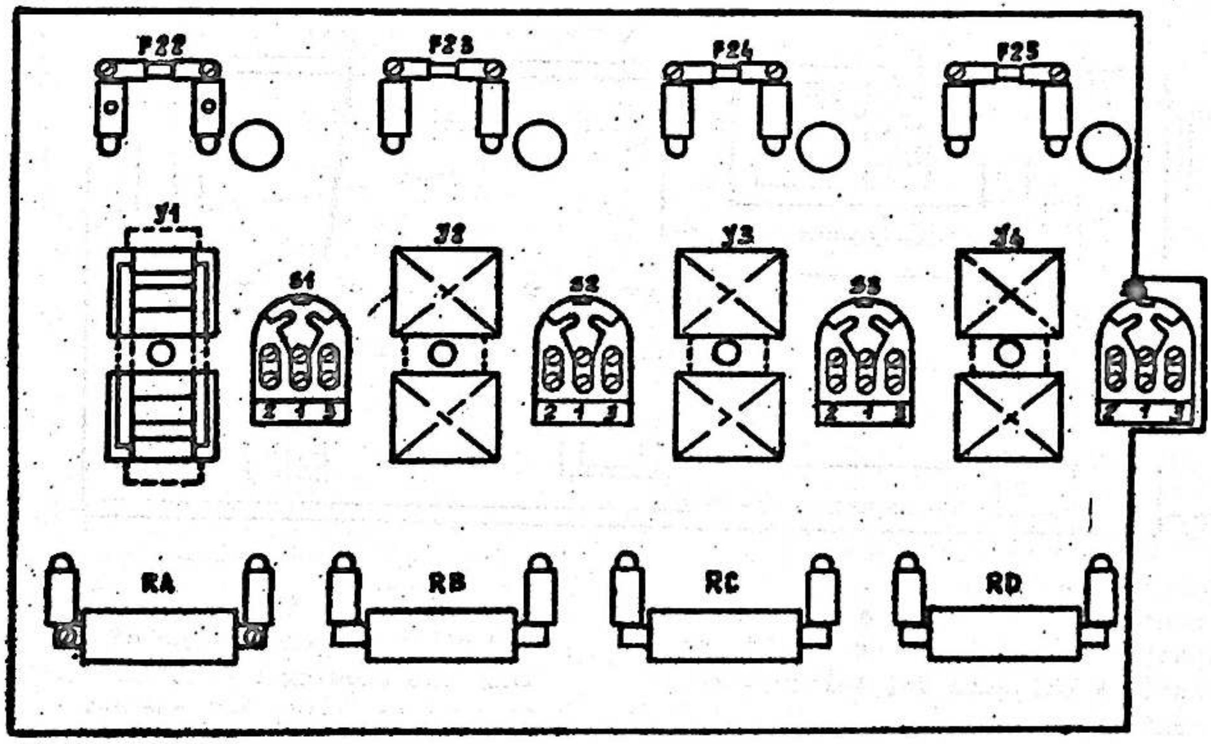
Bring the S1-S2-S3-S4 breakers in pos. 2.

The power supply is thus connected to the internal loads (load resistors).

The four breakers must all be in the same position:

POS. 2 - INTERNAL LOAD

POS. 3 - MACHINE LOAD

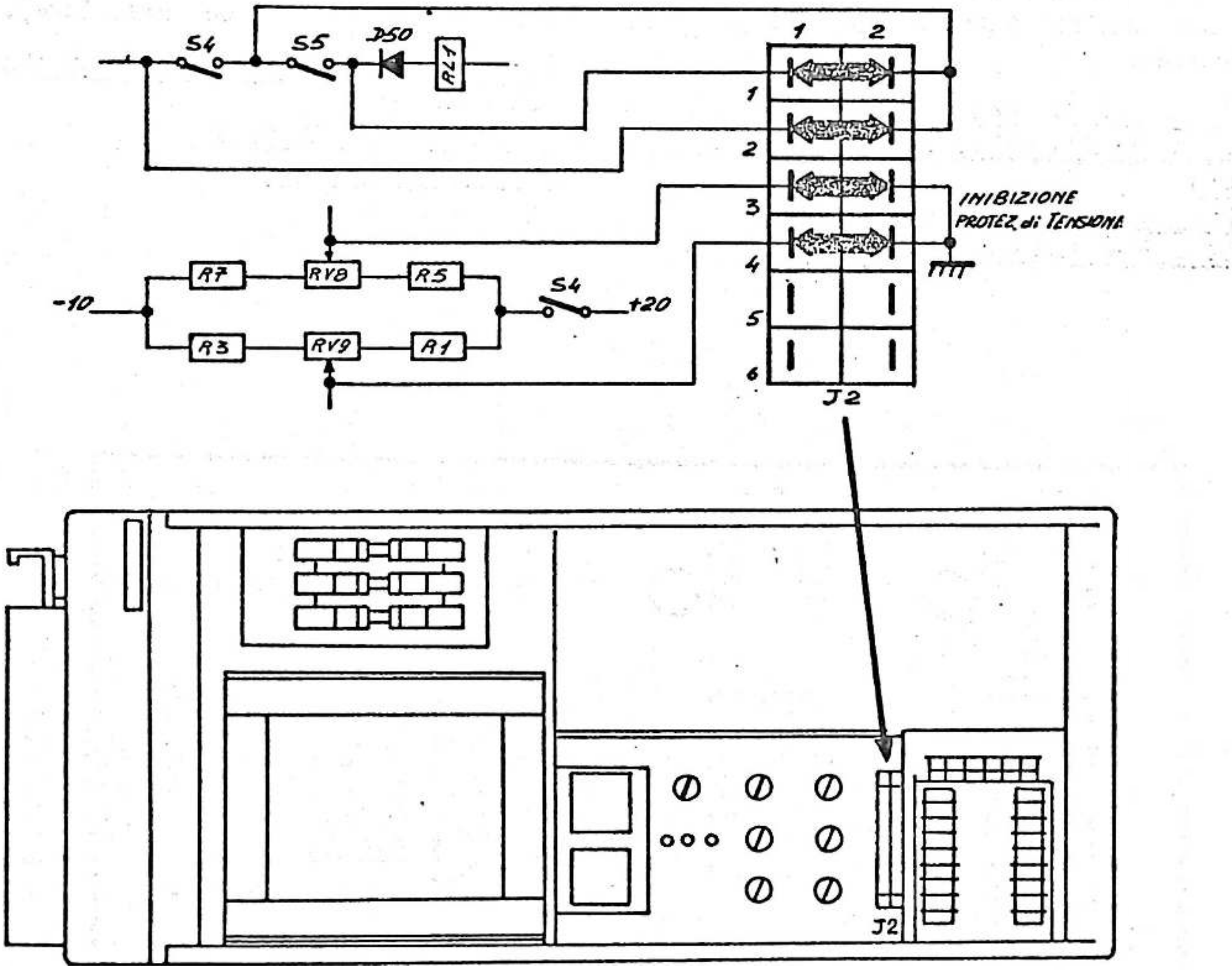


5.2. SCR

Realizzare i quattro ponticelli sul connettore J2, come indicato in figura e aprire i due breakers su ALI 031:

5.2. SCR

Make the four strapping on connector J2, as shown in the figure, and open the two breakers on the ALI 031:



- I ponticelli 1-1 a 1-2 e 2-1 a 2-2 consentono l'eccitazione di RL1 e quindi la chiusura del teleruttore.
- I ponticelli 3-1 a 3-2 e 4-1 a 4-2 escludono i partitori della protezione di tensione, permettendo l'accensione dell'alimentatore.

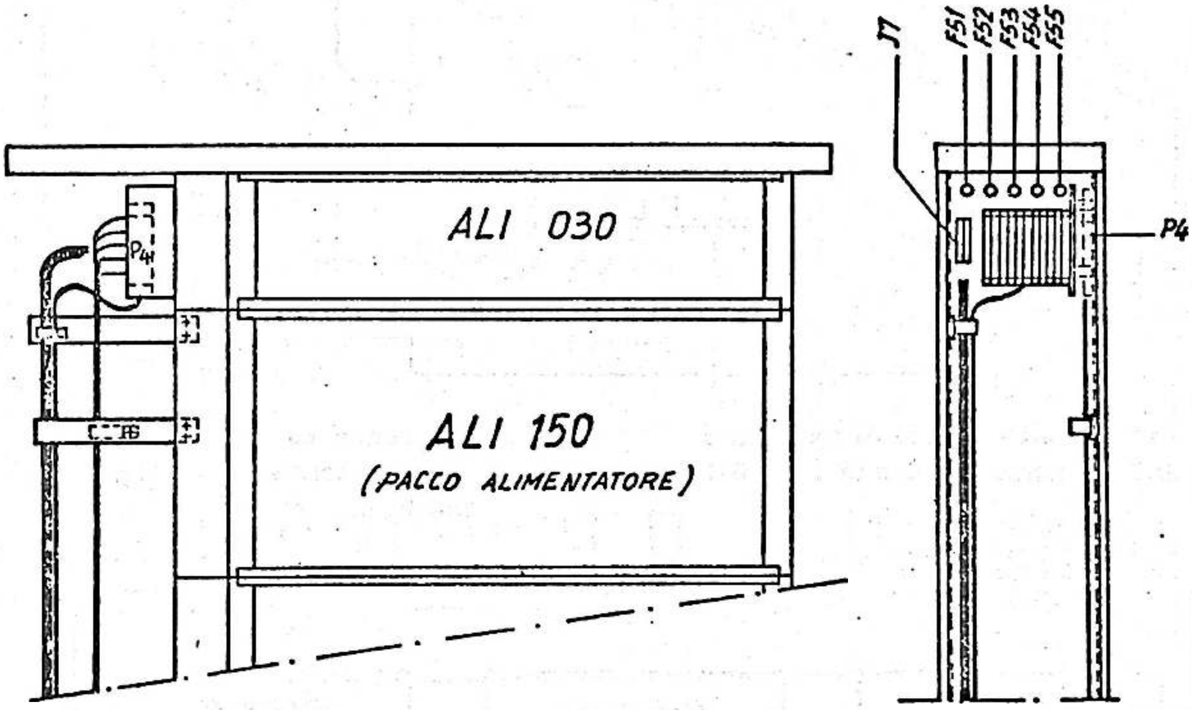
- Strappings 1-1 to 1-2 and 2-1 to 2-2 allow the energising of RL1 and then the closing of the teleswitch.
- Strappings 3-1 to 3-2 and 4-1 to 4-2 exclude the breakers of the voltage protection, allowing the powering-on of the power supply.

6. FUSIBILI

6.1. Disposizione dei fusibili su ALI 030.

6. FUSES

6.1. Arrangement of the fuses on the ALI 030.



Riferimento schemi di macchina:
ALI 030 - Dis. n° 14431010

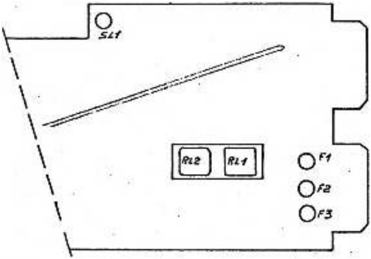
Reference to the machine diagrams: ALI 030 - Drwg. n° 14431010

6.2. Disposizione dei fusibili su ALI 150 - pacco trasformatore.

6.2.1. Pannello posteriore

6.2. Arrangement of the fuses on the ALI 150 - transformer module.

6.2.1. Back panel

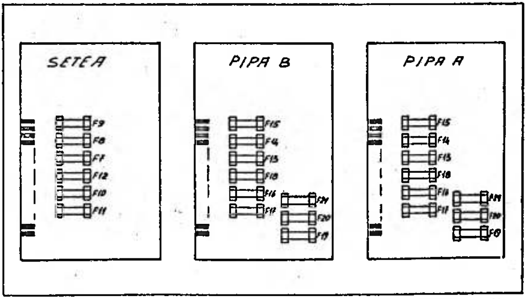


Riferimento schemi di macchina:
ALI 150 Comandi - dis n° 14432012

Reference to machine diagrams
ALI 150 commands - Dwg. - No. 14432012

6.2.2. Interno pannello frontale

6.2.2. Internal front panel

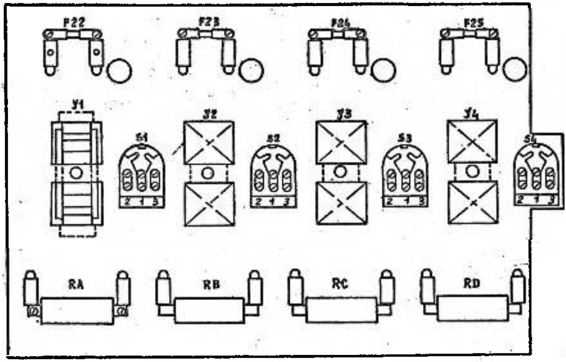


Riferimento schemi di macchina:
ALI 150 - Schemi elettrici - dis.n° 14432310 - f. 1-2-3

Reference to machine diagrams
ALI 150 - Electric diagrams - drwg. No. 14432310 - f.1-2-3

6.3. Disposizione dei fusibili su ALI 150 pacco regolazione

6.3. Arrangement of fuses on ALI 150 adjustment module



Riferimento schemi di macchina:
ALI 150 – Schemi elettrici –
dis. n° 14432310 – f. 1-2-3

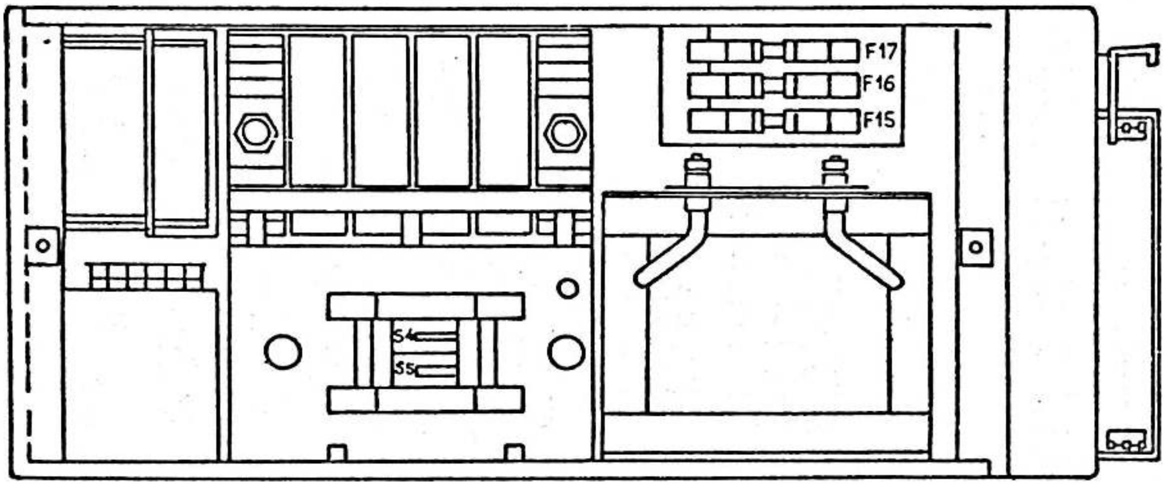
Reference machine diagrams ALI
150 – Electric diagrams –
Drwg. No. 14432310 – f.1-2-3

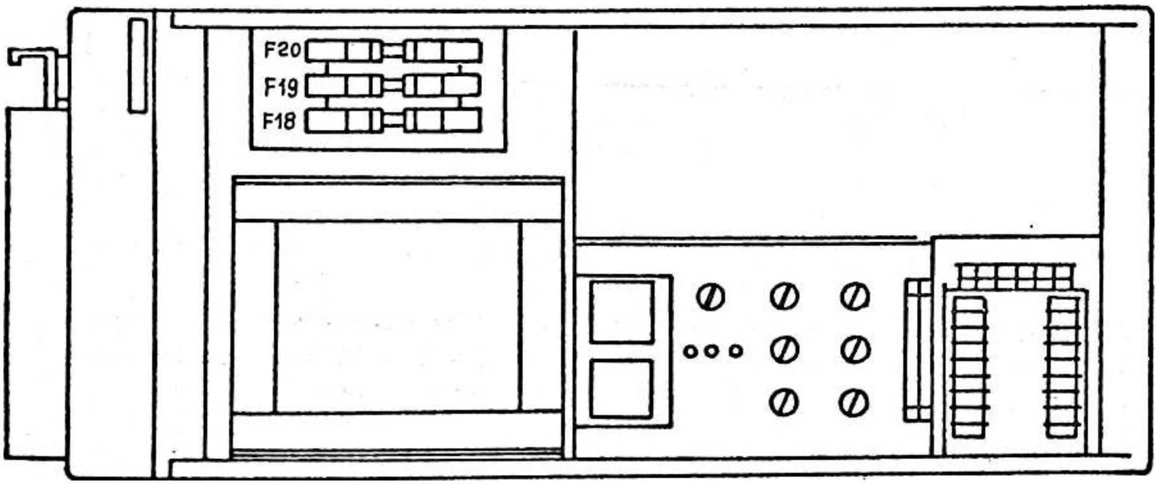
6.4. Disposizione dei fusibili e Breakers su ALI 031.

6.4.1. Fusibili extra rapidi di protezione SCR e Breakers.

6.4. Arrangement of fuses and breakers on ALI 031

6.4.1. SCR protection extra-rapid fuses and breakers



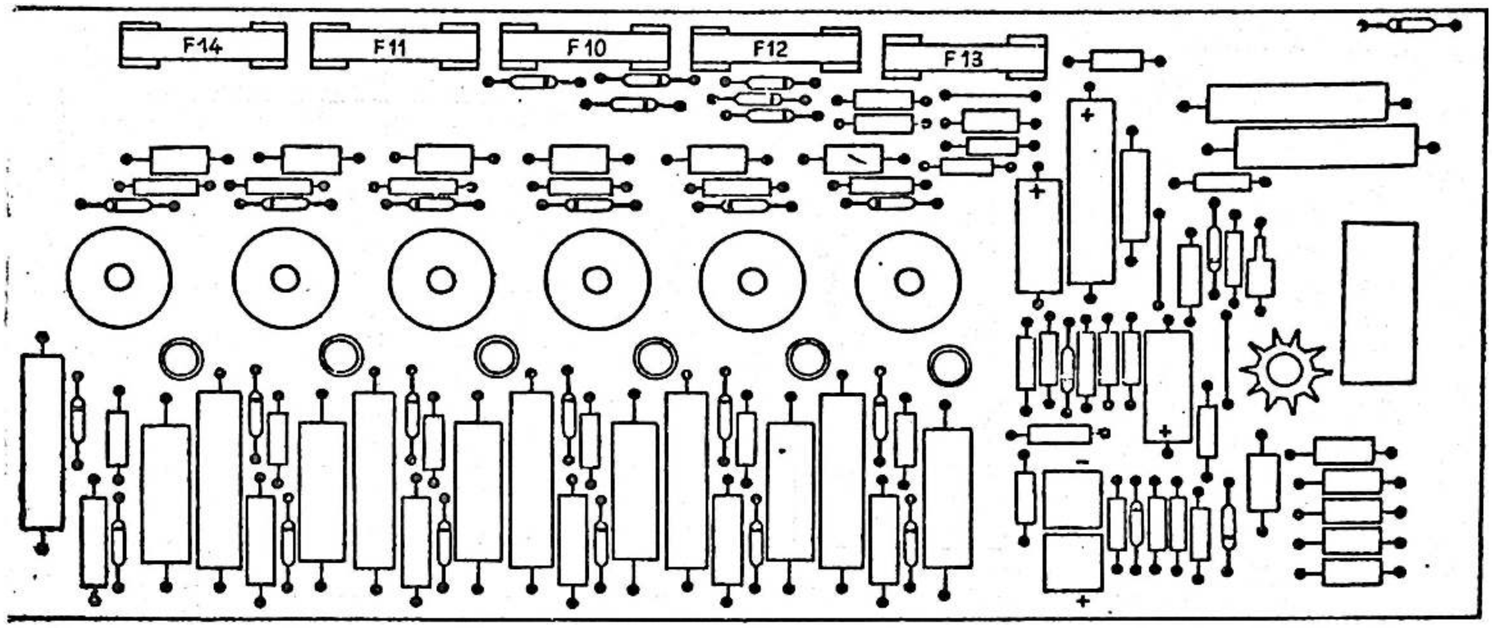


Riferimento schemi di macchina:
ALI 031 - Schema elettrico -
Dis. n° 14431305

Reference to machine diagrams
ALI 031 - Electric diagram -
Drwg. No. 14431305

6.4.2. Disposizione dei fusibili tensioni ausiliarie sulla piastrina OBLO 20.

6.4.2. Auxiliary voltage fuses arrangement on board OBLO 20

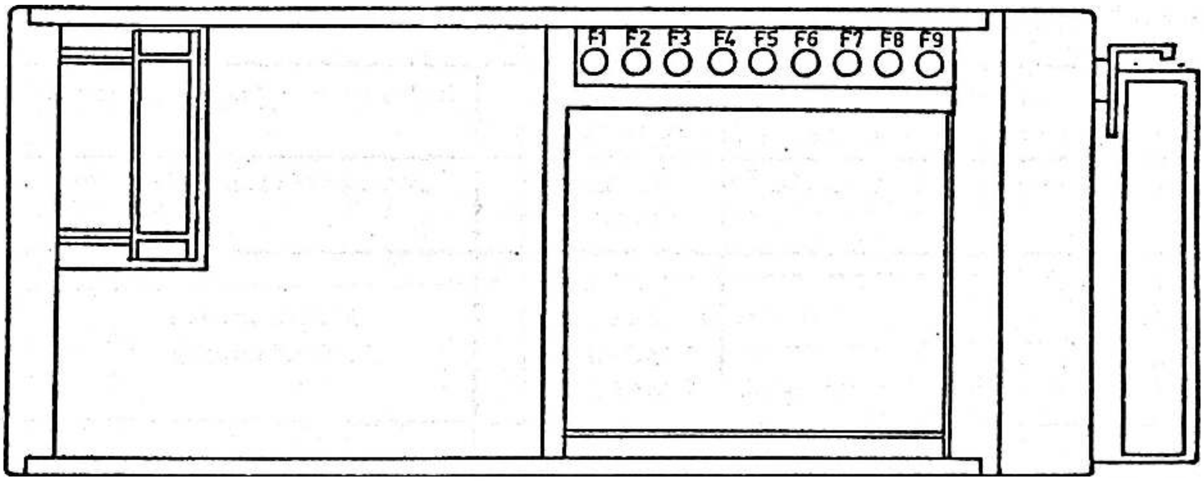


Riferimento schemi di macchina:
ALI 031 - Schema elettrico -
Dis. n° 14431305

Reference to machine diagrams
ALI 031 - Electric diagram -
Drwg. No. 14431305

6.5. Disposizione dei fusibili su ALI 032

6.5. Fuses arrangement on ALI 032



Riferimento schemi elettrici:
ALI 032 - Schema elettrico -
n° 14433294

Reference to electric diagrams
ALI 032 - Electric diagrams -
n° 14433294

7. CIRCUITO COMANDI

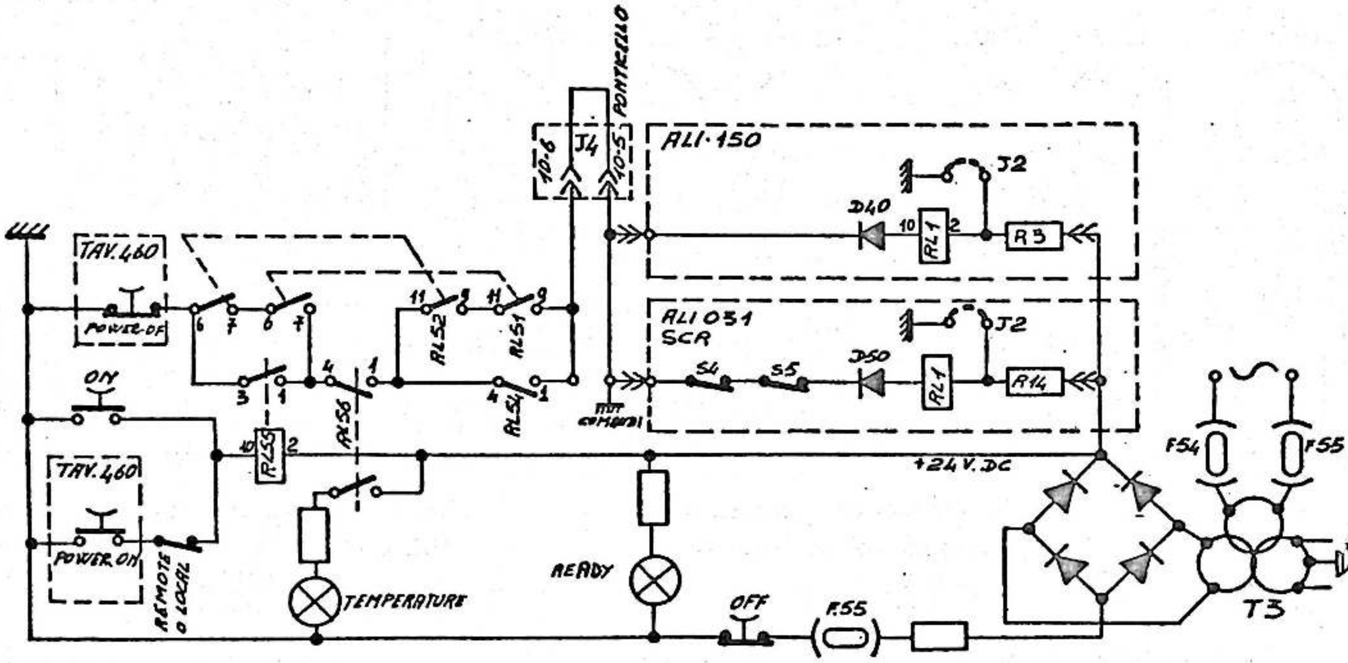
7.1. Circuito comando teleruttori ALI 030.

7.1.1. Schema elettrico generale.

7. DRIVING CIRCUIT

7.1. ALI 030 teleswitches driving circuit.

7.1.1. General electric diagram.



7.1.2. Riferimenti documentazione

7.1.2. Documentation references

Unità elementari interessate	N° Disegni di macchina	Riferimento Documentazione
Interested elementary units	Machine Drwg. No.	Documentation Reference
ALI 030 ALI 031 ALI 032 ALI 150	14431010 14431305 14433294 14432012	Alimentatore Power supply
TAV 460	14032002	Sottosistema Console Console Subsystem

7.1.3. Tabella componenti

7.1.3. Components

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
"DC" (lamp)	ALI 030	Accesa in condizione di normale funzionamento, indica presenza della tensione continua in uscita. Lit in condition of normal performance, it indicates the presence of the D.C. voltage in output.
F53,F54	ALI 030	Fusibili Fuses
F55	ALI 030	Fusibile Fuse
"OFF" (comando)	ALI 030	Spegne le continue Switches the D.C. voltages OFF
"ON" (comando)	ALI 030	Accende le continue Switches the D.C. voltages ON
Ponticello	ALI 030	Sempre presente (viene soppresso se ci sono condizionamenti esterni) Always present (it is taken OFF if there are external conditionings
"Power OFF" (comando)	TAV 460	Spegne le continue Switches the D.C. voltages OFF

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
RL51 RL52	ALI 030	Entrambi eccitati in condizione di normale funzionamento. RL51 si diseccita con segnale di errore dalle unità di potenza, oppure per un guasto al circuito di protezione. RL52 si diseccita con segnale di errore dalle unità di potenza, oppure per un guasto al circuito di protezione.
		Both energized in normal performance condition. RL51 is released with an error signal from the power units, or for a failure to the protection circuit. RL52 is released with an error signal from the power units for a failure to the protection circuit.
RL54	ALI 030	Diseccitato in condizioni di normale funzionamento. Mantenendo premuto il pulsante "ON", normalmente, l'eccitazione di RL54 (vedi cap. 9) deve essere successiva alla eccitazione di RL51 e RL52.
		Not energized in normal performance conditions. Keeping the button "ON" pressed normally the energizing of RL54 (refer chapt. 9) must be subsequent to the energizing of RL51 and RL52.
RL55	ALI 030	Diseccitato in condizioni di normale funzionamento. Si mantiene eccitato per tutto il tempo di premuta del tasto "ON".
		Not energized in normal performance conditions. It is kept energized for the whole period of change of the "ON" button.

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
RL56	ALI 030	Diseccitato in condizioni di normale funzionamento. Si eccita quando si verifica una sovratemperatura (vedi cap. 8). Not energized in normal performance conditions. It is energized when an over temperature occurs (see chapt. 8).
READY (lamp.)	ALI 030	Accesa indica la presenza della tensione di servizio +24 V e che l'alimentatore è pronto per l'accensione (da ALI 030 col tasto "ON" e da "TAV 460" col tasto "Power ON"). Lit, it indicates the presence of the +24 V service voltage and that the power supply is ready for powering-on (from ALI 030 with the button "ON" and from "TAV 460" with the button "Power ON").
R85	ALI 030	Resistenza di limitazione Limit resistance
S3	ALI 030	Deviatore 1 via 2 posizioni "REMOTE" e "LOCAL". Quando è posizionato su "LOCAL" esclude la possibilità di accensione della continua dal lato TAV 460. Switch 1 with two positions "REMOTE" and "LOCAL". When it is positioned on "LOCAL" it excludes the possibility of switching on the D.C. voltage from TAV 460.

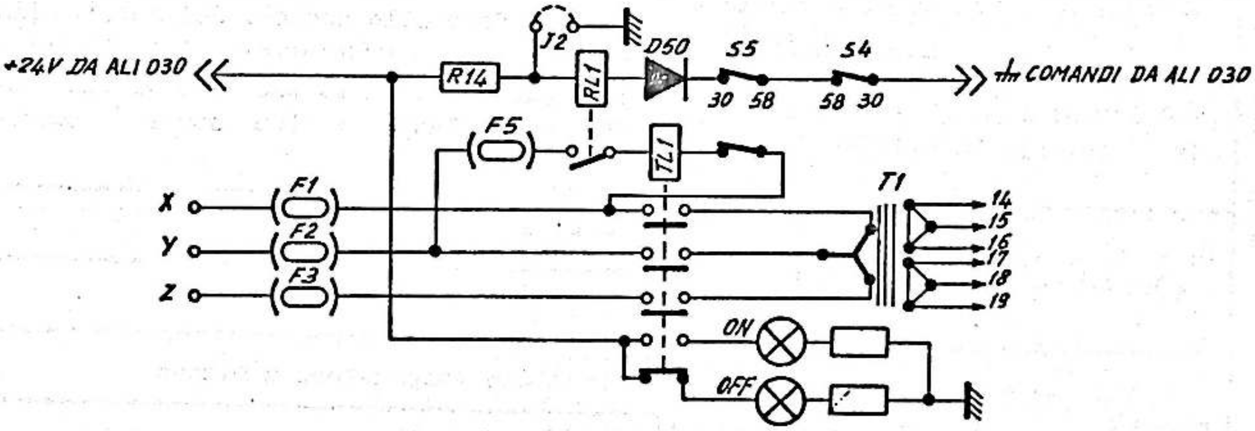
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
S4-S5	ALI 031	BREAKERS di protezione. Normalmente sono posizionati in ON. Quando uno dei due breakers passa in posizione OFF, non è possibile riaccendere l'alimentatore fino a quando non vengono ripristinate le condizioni iniziali (ON). Protection BREAKERS. Normally they are set on ON. When one of the two breakers goes to the OFF position, it is not possible to switch the power supply on until the initial conditions (ON) are not reset.
T3	ALI 030	Trasformatore di servizio Service transformer
"Temperature" (lamp.)	ALI 030	Si accende quando si verifica una sovratemperatura sull'alimentatore o per il posizionamento in "OFF" del VAR 300. In caso di sovratemperatura si accende anche un'altra lampada di segnalazione su ALI 031 o su ALI 150. Dette lampade consentono di distinguere su quale unità di alimentazione si è verificata la sovratemperatura. It is lit, when there is an overtemperature on the power supply or when the VAR 300 is positioned on "OFF". In case of overtemperature, also another signal lamp is lit on the ALI 031 or ALI 150. These lamps allow to see on which power supply unit the overtemperature has occured.

7.2. Circuito di alimentazione TL1 - SCR.

7.2. Power supply circuit TL1 - SCR

7.2.1. Schema elettrico

7.2.1. Electric diagram



7.2.2. Riferimenti documentazione

7.2.2. Documentation reference

Unità elementari interessate	N° Disegni di macchina	Riferimento Documentazione
Interested elementary units	Machine Drwg. No.	Documentation Reference
ALI 030 ALI 031 ALI 032	14431010 14431305 14433294	Alimentatore Power supply

7.2.3. Tabella componenti

7.2.3. Components

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
D50	ALI 031	Diodo saldato allo zoccolo del rele' RL1, disaccoppia dagli altri circuiti di comando
		The diode soldered to the base of the RL1 relay uncouples from the other command circuits
F1-F2-F3-F5	ALI 032	Fusibili
		Fuses
"OFF" lampade "ON"	ALI 030	Accesa con teleruttore a riposo
		Lit with teleswitch not energized
		Accesa con teleruttore a lavoro
		Lit with teleswitch energized
R14	ALI 031	Resistenza sulla alimentazione di RL1 - Piastra OBLO
		Resistance on the RL1 power supply - OBLO Board
RL1	ALI 031	A lavoro in condizioni di normale funzionamento, condiziona la chiusura del teleruttore TL1.
		Working in normal performance conditions, it conditions the closing of the TL1 teleswitch.

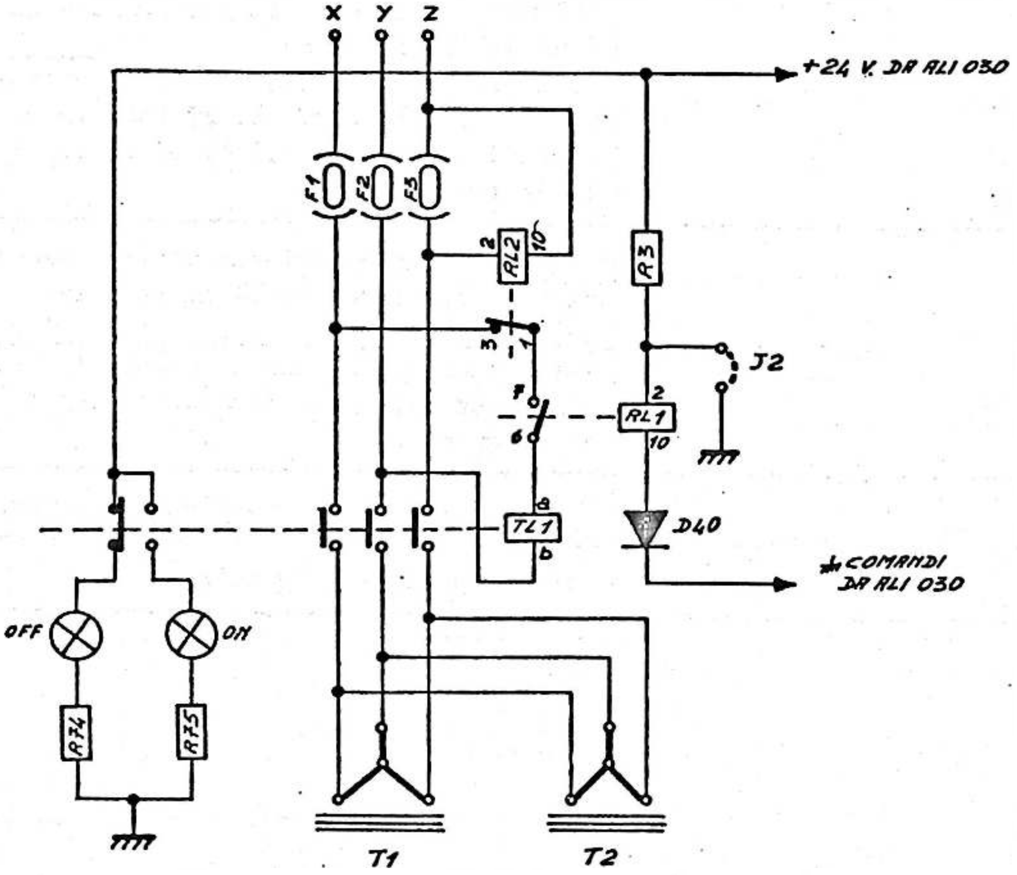
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
RL2	ALI 031	Normalmente a riposo. Passa a lavoro in seguito all'interruzione del fusibile F3 in ALI 032, escludendo la possibilità di chiusura del teleruttore.
		Normally not energized. It is energized by the interruption of the F3 fuse in ALI 032, excluding the possibility of closing the teleswitch.
T1	ALI 032	Trasformatore di potenza trifase/esafase di alimentazione del ponte di raddrizzamento e regolazione.
		Three phases/six phases power transformer for power supply of the rectifying bridge and regulator.
TL1	ALI 031	Teleruttore di alimentazione generale.
		General power supply teleswitch

7.3. Circuito di eccitazione TL1 - ALI 150.

7.3.1. Schema elettrico

7.3. TL1 energization circuit ALI 150.

7.3.1. Electric diagram

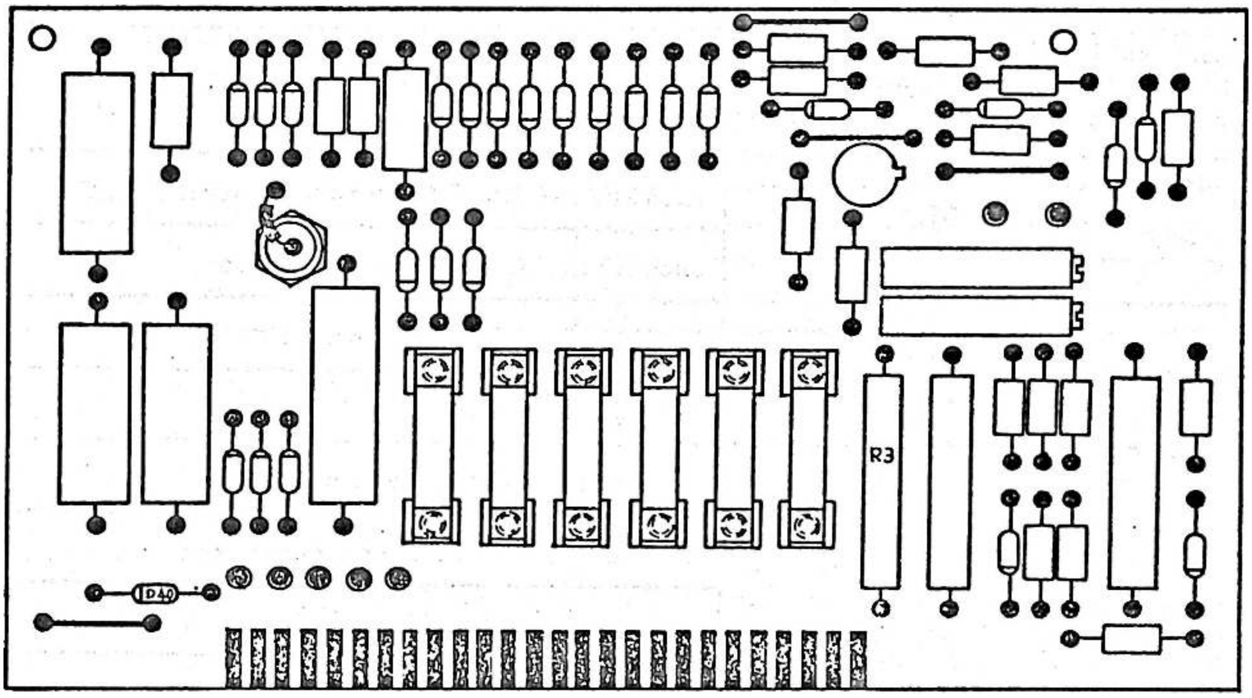


7.3.2. Disposizione topografica componenti.

7.3.2. Components topographic arrangement.

Piastrina SETE-A

SETE-A board



7.3.3. Riferimento documentazione

7.3.3. Documentation reference

Unità elementari interessate	N° Disegni di macchina	Riferimento documentazione
Interested Elementary Units	Machine Drwg. No.	Documentation reference
ALI 150 - P. Trasform.	14432012	Alimentatore Power supply

7.3.4. Tabella componenti

7.3.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
D40	ALI 150 P.REG.	Diodo di disaccoppiamento - Piastrina SETE-A
		Uncoupling diode - SETE-A Board
F1-F2-F3	ALI 150 P.TRASF.	Fusibili generali alternata
		A.C. general fuses
"OFF" lampade	ALI 030	Accesa con teleruttore a riposo
		Lit with teleswitch not energized
"ON" lampade		Accesa con teleruttore a lavoro
		Lit with teleswitch energized
R3	ALI 150 P.TRASF.	Resistenza sulla alimentazione di RL1 - Piastrina SETE-A
		Resistance on the RL1 power supply - SETE-A Board
RL1	ALI 150 P.TRASF.	A lavoro in condizioni di normale funzionamento - Condiziona la chiusura del teleruttore TL1.
		During normal performance conditions. It conditions the closing of the TL1 teleswitch.
RL2	ALI 150 P.TRASF.	Normalmente a riposo - Passa a lavoro quando si interrompe F3 escludendo la possibilità di chiusura del teleruttore.
		Normally not energized. It works when F3 is interrupted, excluding the possibility to close the teleswitch.

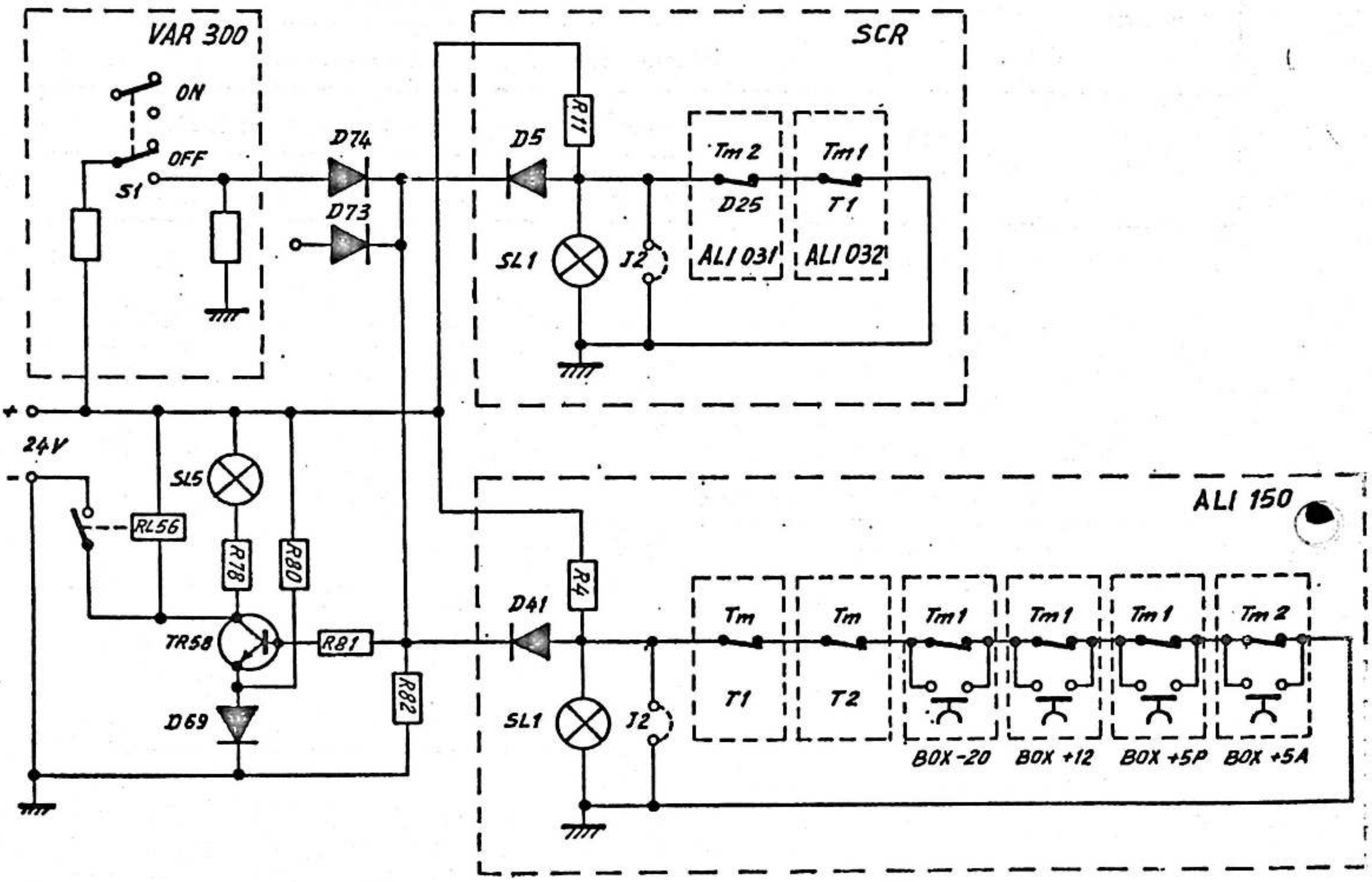
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
T1–T2	ALI 150 P.TRASF.	Trasformatori di alimentazione di potenza
		Power transformers of power supply
TL1	ALI 150 P.TRASF.	Teleruttore di alimentazione generale
		General power supply teleswitch

8. CIRCUITO PROTEZIONE SOVRATEMPERATURA

8. OVERTEMPERATURE PROTECTION CIRCUIT

8.1. Schema elettrico

8.1. Electric Diagram

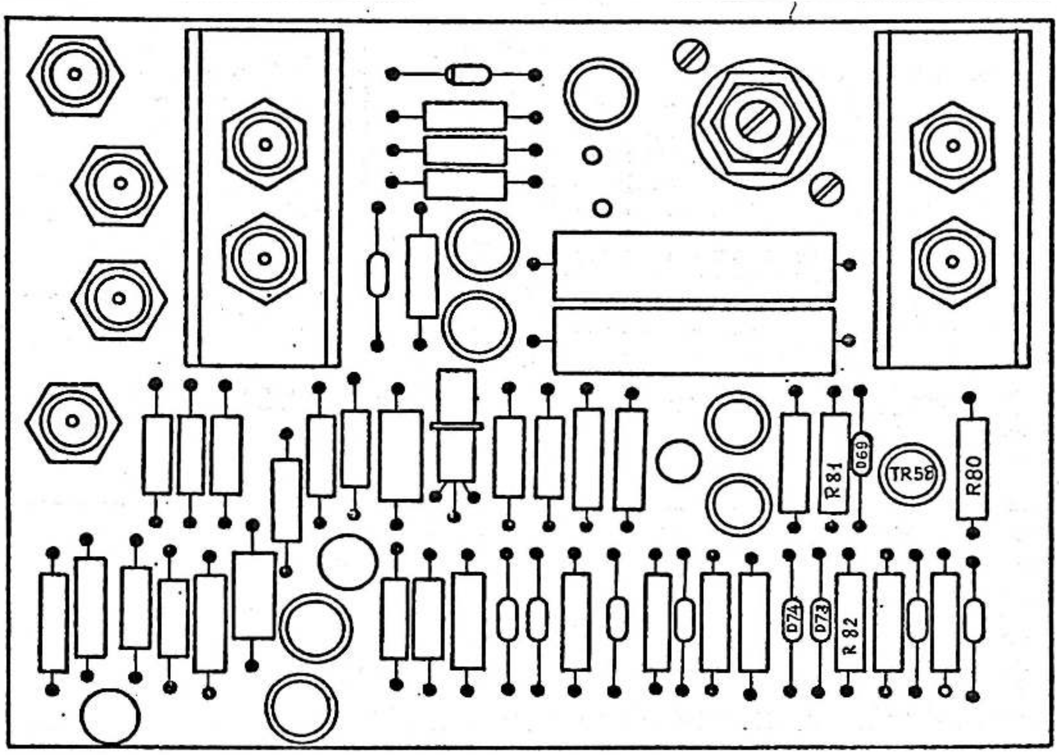


8.2. Disposizione topografica componenti sull'ALI SCR

ALI 030 - Piastrina PACO 03

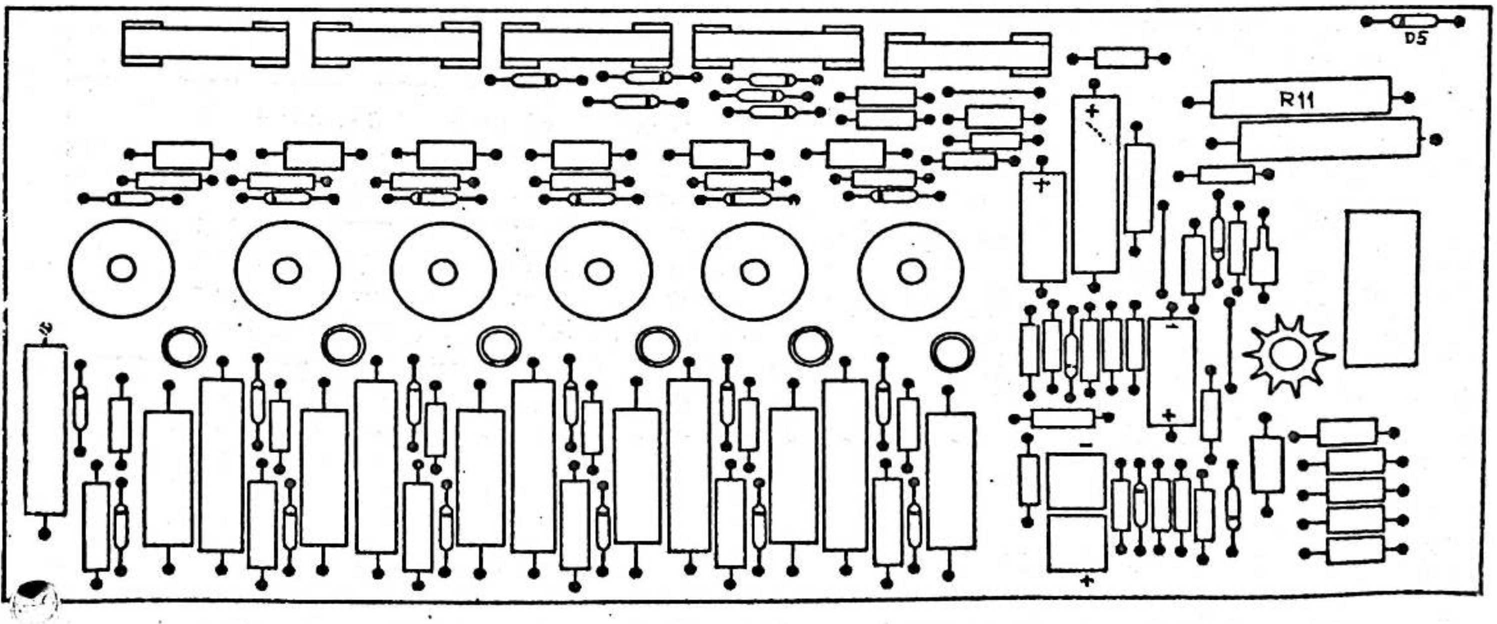
8.2. Components topographic arrangement on ALI SCR

ALI 030 - PACO 03 Board



ALI 031 - Piastrina OBLO 20

ALI 031 - OBLO 20 board



8.2.1. Riferimenti documentazione

8.2.1. Documentation reference

Unità elementari interessate	N° Disegni di macchina	Riferimento Documentazione
Interested elementary units	Machine Drwg. No.	Documentation Reference
ALI 030	14431010	Alimentatore Power supply
ALI 031	14431305	
ALI 032	14433292	

8.2.2. Tabella componenti

8.2.2. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Logic and electric functions
D5	ALI 031	Diodo separatore montato su piastra OBLO
		Separatory diode assembled on OBLO board
D69-73-74	ALI 030	Diodi montati su piastra PACO 03
		Diodes assembled on PACO 03 board
R11	ALI 031	Resistenza montata su piastra OBLO
		Resister assembled on OBLO board
R78÷82	ALI 030	Resistenze montate su piastre PACO 03
		Resistors assembled on PACO 03 boards

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
RL56	ALI 030	Relé diseccitato in condizione di normale funzionamento. Si eccita quanto si manifesta una sovratemperatura sull'unità SCR o sulla unità ALI 150; inoltre quando si posiziona in "OFF" il deviatore a levetta del VAR 300 (PIEDE DELL'ALA).
		Relay not energized in normal performance conditions. It is energized when there is an overtemperature on the SCR unit or on the ALI 150 unit and also when the lever switch of the VAR 300 is set in OFF (FOOT OF THE WING).
SL1	ALI 031	Normalmente spenta. Si accende quando si manifesta una sovratemperatura sul trasformatore di potenza (ALI 032) o quando si surriscaldano i diodi di potenza. Si accende insieme a SL5 (ALI 030).
		Normally OFF. It is lighted when there is an overtemperature on the power transformer (ALI 032) or when the power diodes are overheated. It turns on with SL5 (ALI 030).
SL5 (TEMPERATURE)	ALI 030	Normalmente spenta. Si accende per sovratemperatura sull'unità SCR o sull'unità ALI 150. Si accende anche in seguito al posizionamento in OFF del deviatore a levetta del VAR 300.
		Normally OFF. It turns on for an overtemperature on the SCR unit or on the ALI 150 unit. It turns on also after the positioning on OFF of the lever switch of the VAR 300.

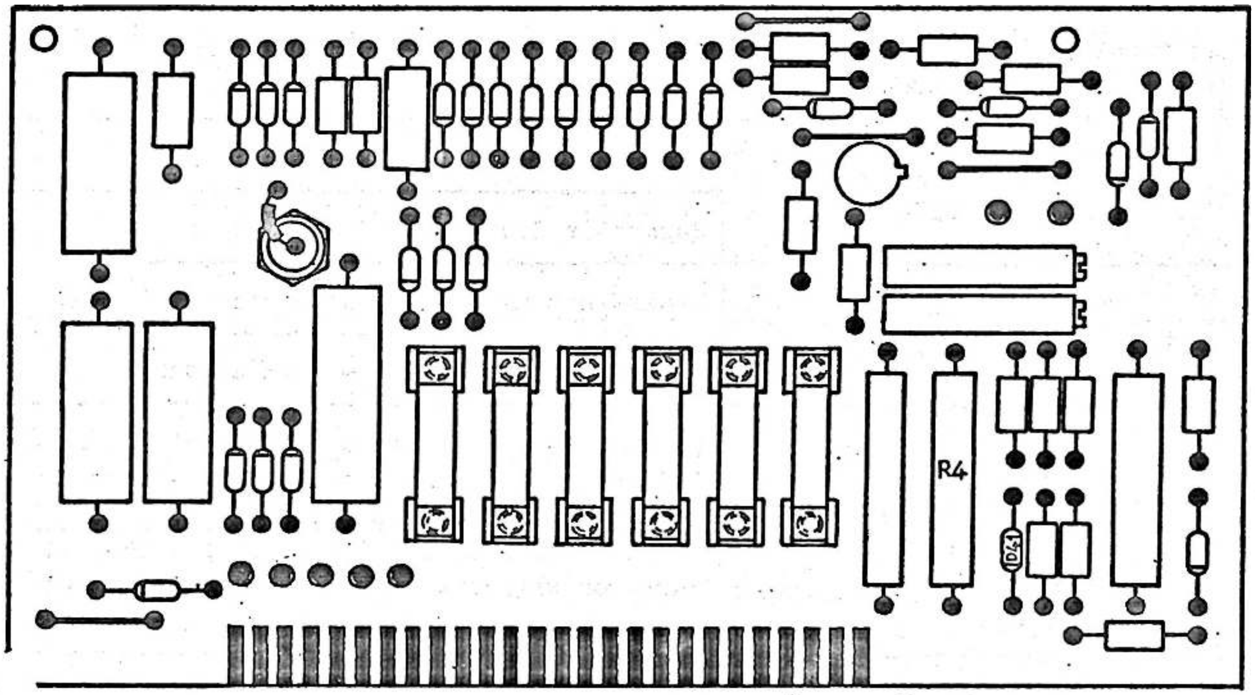
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
Tm 1	ALI 032	Termoswitch montato internamente al trasformatore T1, normalmente chiuso. Si apre in seguito a surriscaldamento (130°C) del trasformatore. L'apertura del termoswitch determina l'intervento della protezione termica. Thermoswitch fitted internally to the transformer T1, normally closed. It opens because of overheating (130°C) of the transformer. The opening of the thermoswitch causes the intervention of the thermal protection.
Tm 2	ALI 031	Thermoswitch. Normalmente chiuso, si apre in seguito al surriscaldamento dei diodi di potenza. E' montato sul dissipatore posto più vicino al ventilatore (D25). Apre a 75°C. Thermoswitch. Normally closed, it opens after the over - heating of the power diodes. It is fitted on the dissipator nearest to the blower (D25). It opens at 75°C.
TR58	ALI 030	Transistore interdetto in condizione di normale funzionamento, viene messo in conduzione in seguito a sovratemperatura e posizionando in OFF il deviatore del VAR 300. Transistor OFF in normal performance condition, it is turned on after an overheating and positioning in OFF the switch of the VAR 300.

8.3. Disposizione topografica componenti ALI 150

Pacco trasformatori:
PIASTRINA SETE A

8.3. Topographic arrangement of components on ALI 150

Transformers module:
SETE A board



8.3.1. Riferimento documentazione

8.3.1. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento Documentazione
Interested elementary units	**Drwg. No.**	**Documentation reference**
ALI 150 - P. TRASFORMATORI	14432012	**Alimentatore** **Power supply**
ALI 150 - BOX TENSIONI	14432010 f. 1,2,3	

8.3.2. Tabella componenti

8.3.2. Components table

Componenti in ordine alfabetico e numerico	Unita elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D41	ALI 150 P.TRASF.	Diodo separatore - Piastrina SETE-A
		Separator diode - SETE A board
R 4	ALI 150 P.TRASF.	Resistenza alimentazione - Piastr. SETE-A
		Power supply resistor - SETE A board
SL1	ALI 150 P.TRASF.	Lampada segnalazione sovratemperatura in ALI 150. Si accende quando si apre uno dei termostati - Pannello pacco trasformatori.
		Overtemperature signal lamp in ALI 150. It turns on when one of the thermostats opens. Transformers module panel
S 5	ALI 150 P.REG.	Pulsante in parallelo ai termostati nei box tensione
		Switch in parallel with the thermostats in the voltage boxes.
S 6	ALI 150 P.REG.	Pulsante in parallelo al termostato nel box + 5V ampliamento
		Switch in parallel with the thermostat in the box + 5V enlargement
Tm/T1	ALI 150 P.TRASF.	Termostato segnalazione sovratemperatura impregnato nel trasformatore T1.
		Overtemperature signal thermostat on transformer T1
Tm/T2	ALI 150 P.TRASF.	Termostato segnalazione sovratemperatura impregnato nel trasformatore T2.
		Overtemperature signal thermostat on transformer T2

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
Tm1	ALI 150 F.REG.	Termostati di segnalazione sovratemperatura dei transistori di potenza: TR1 - Box tensioni e TR13 Box + 5V ampliamento Overtemperature signal thermostats of the power transistors: TR1 - Voltage boxes and TR13 Box + 5V enlargement.

8.4. Sequenza di operazioni e controlli sul circuito di sovratemperatura

1) Su VAR 300 disporre il deviatore in posizione OFF e verificare l'eccitazione del relé RL56 e la accensione su ALI 030 della lampada "TEMPERATURE".

2) Su VAR 300 disporre il deviatore in posizione "ON". Spegnere e riaccendere le alternate per fare scomparire la segnalazione di "TEMPERATURE". Su ALI 032 morsettiera P2 scollegare un filo al punto 11 e verificare l'eccitazione del relé RL 56 e la accensione su ALI 030 della lampada "TEMPERATURE".

3) Ripristinare le condizioni iniziali.

La segnalazione "TEMPERATURE" può nascere per sovratemperatura sull'unità SCR o sull'unità ALI 150: l'apposita lampada SL1 "TEMPERATURE" su ALI 031 e sul pacco trasformatori di ALI 150 ne permette la discriminazione.

8.4. Sequence of operation and control on overtemperature SCR circuit

1) On the VAR 300 set the switch in OFF position and check the RL56 relay energizing and the turning on of the "TEMPERATURE" lamp on the ALI 030.

2) On the VAR 300, set the switch in position "ON". Turn off and again on the a.c. to make the signal TEMPERATURE disappear. On ALI 032 terminal box P2 disconnect a wire in point 11 and check the energizing of RL56 relay and the turning on of the "TEMPERATURE" lamp on the ALI 030.

3) Reset the initial conditions.

The "TEMPERATURE" signal may be caused by overtemperature on the SCR unit or on the ALI 150 unit: the special SL1 "TEMPERATURE" lamp on ALI 031 and on the ALI 150 trasformers module allows its distinction.

8.4.1. Sovratemperatura su SCR

Verificare:

1) Efficienza dei ventilatori e dei filtri su ALI 031 e ALI 032.
2) Tensione di rete.
3) Carico dell'alimentatore (in base alla tabella di cap.22).

8.4.2. Sovratemperatura su ALI 150

1) Discriminare il termostato che mantiene la segnalazione di sovratemperatura tramite i pulsanti S5 dei Box Tensione e S6 del Box Ampliamento.
2) Se la segnalazione è dovuta ai termostati dei trasformatori, verificare:
   a) tensione di rete
   b) carico dell'alimentatore (cap. 22)
   c) diodi raddrizzatori di potenza.
3) Se la segnalazione è dovuta a sovratemperatura in un box, verificare:
   a) efficienza del ventilatore e dei filtri
   b) carico dell'alimentazione (vedi tab. cap. 22)
   c) f.d.o. del transistore di regolazione di potenza (TR1 box tensioni e TR13 box ampliamento).
      Per tale verifica vedere par. 16.1.5.

La segnalazione "TEMPERATURE" nasce anche quando viene tolto uno o piu box.

8.4.1. Overtemperature on SCR

Check:

1) Efficiency of the blowers and of the filters on ALI 031 and ALI 032.
2) Mains voltage.
3) Power supply load (according to table of chapt.22).

8.4.2. Overtemperature on ALI 150

1) Discriminate the thermostat which maintains the signal of overtemperature through switches S5 of the voltage Boxes and S6 of the enlargement Box.
2) If the signal is due to the thermostats of the transformes, check:
   a) Mains voltages
   b) Power supply load
   c) Power rectifiers diodes.
3) If the signal is due to an over-temperature in one box, check:
   a) efficiency of the blower and filters
   b) power supply load (refer to table of chapt.22).
   c) wave form of the transistor of power adjustment (TR1 voltage box and TR13 enlargement box).
      For this check, refer to par. 16.1.5.

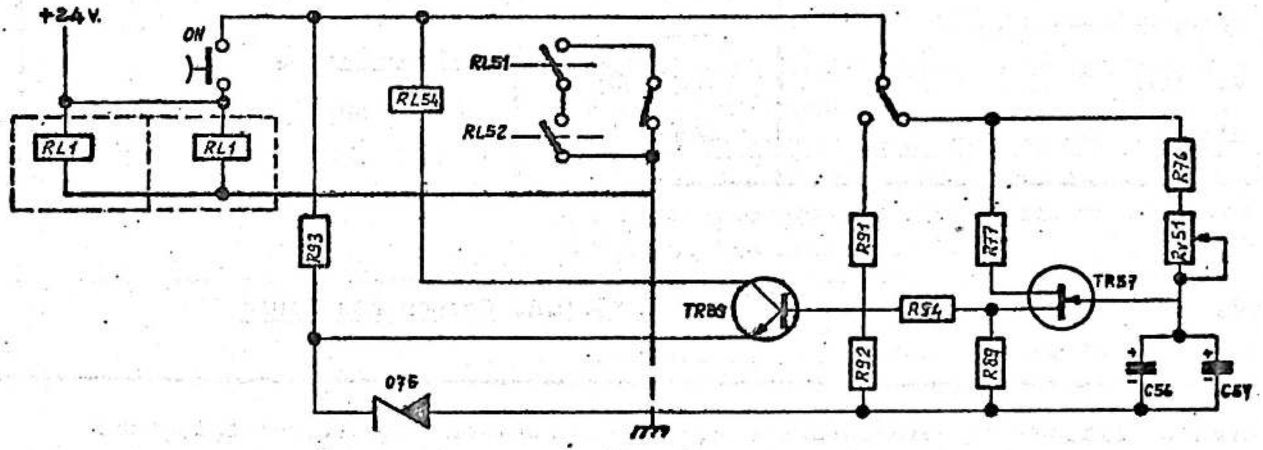
The "TEMPERATURE" signal is caused also when one or more boxes are taken away.

9. TEMPORIZZATORE DI AVVIAMENTO - ALI 030

9. STARTING TIMER - ALI 030

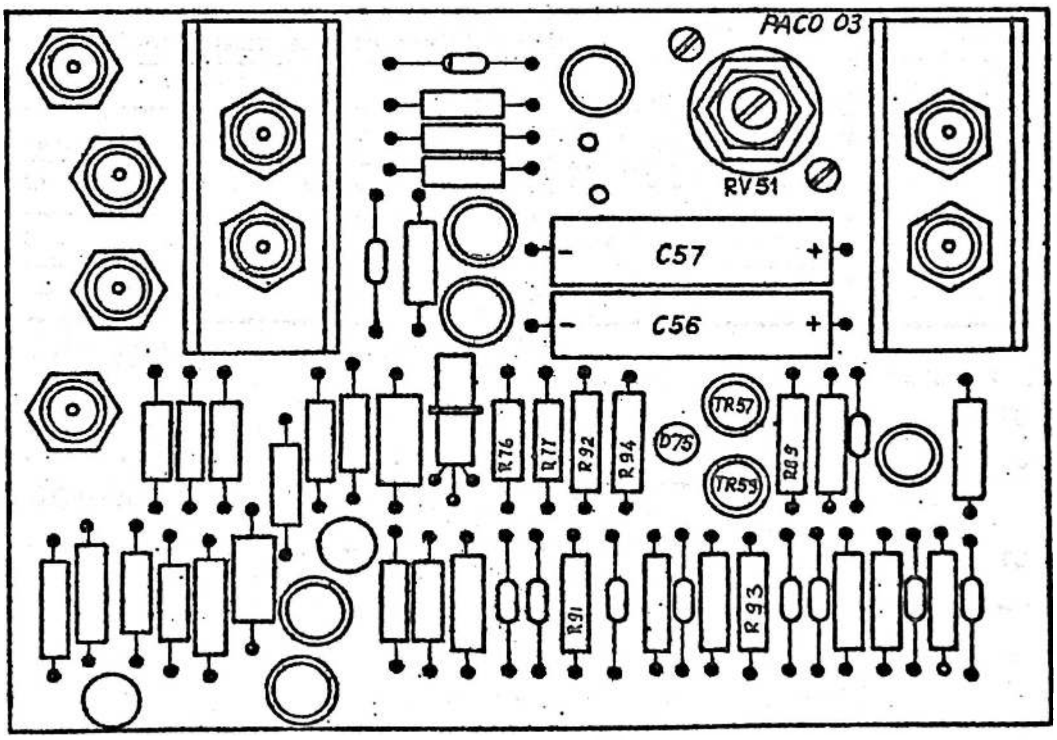
9.1. Schema elettrico

9.1. Electric diagram



9.2. Disposizione topografica componenti - Piastrina PACO 03

9.2. Topographic arrangements of components - PACO 03 Board



9.3. Riferimento documentazione

9.3. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento Documentazione
Interested elementary unit	Drwg. No.	Documentation Reference
ALI 030 ALI 031 ALI 150	14431010 14431305 14432012	Alimentatore Power supply

9.4. Tabella componenti

9.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D56 - D57	ALI 030	Condensatori della costante di tempo - Piastrina PACO 03 Capacitors of the time constant on the PACO 03 board
D75	ALI 030	Diodo Zener 2,7V ± 10% - Piastrina PACO 03 Zener Diode 2,7V ±10% - FACO 03 board
"ON"	ALI 030	Accensione continue dal lato ALI 030 D.C. switching on from ALI 030 side
RL1	ALI 031	Eccitato in condizione di normale funzionamento. Energized in normal performance condition.
RL1	ALI 150	Eccitato in condizioni di normale funzionamento. Energized in normal performance condition.

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
RL51 - RL52	ALI 030	Eccitati in condizione di normale funzionamento. Permangono eccitati se le tensioni di uscita rimangono al valore nominale.
		Energized in normal performance condition. They stay energized if the output voltages stay at the nominal.
RL 54	ALI 030	Diseccitato in condizione di normale funzionamento. Si eccita con un ritardo di 2 sec. dal comando del tasto "ON" (ALI 030) e permane eccitato. In condizioni normali l'eccitazione di RL54 avviene dopo l'eccitazione di RL51 e RL52
		De-energized in normal performance condition It energizes with a delay of 2 sec. from the "ON" key command (ALI 030) and stays energized. In normal conditions the energizing of RL54 occurs after the energizing of RL51 and RL52.
RV 51	ALI 030	Potenziometro per la regolazione da 1 a 10 sec. del tempo che intercorre tra il comando del tasto "ON" e l'eccitazione di RL54.
		Potenzioneter for the adjustment from 1 to 10 sec. of the time which elapses between the command of the "ON" key and the energizing of RL54.
R73 + R93	ALI 030	Resistenze sulla piastrina PACO 03
		Resistances on the PACO 03 board.

9.5. Sequenza di controlli per verificare l'efficienza del tempo - rizzatore di avviamento

Su ALI 030 mantenere premuto il tasto "ON" e verificare che dopo un minimo di 1 sec. e un massimo di 10 sec. si ecciti RL54. Il tempo è regolabile mediante il potenziometro RV51 e viene fissato intorno ai 2 sec.

9.5. Sequence of controls to check the efficiency of the circuit of the starting timer.

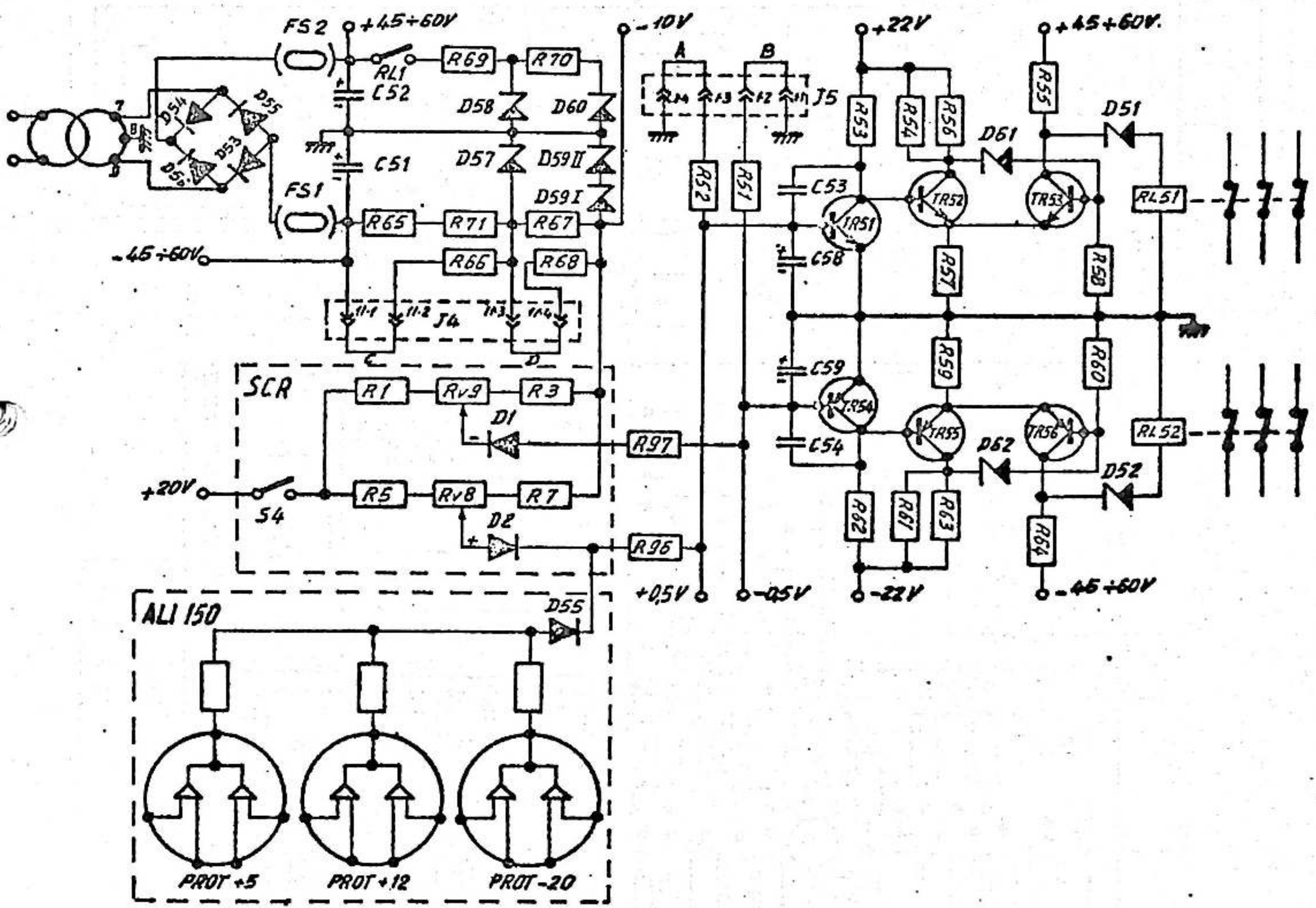
On the ALI 030 maintain the "ON" key pressed and check that after a minimum time of 1 sec. and a maximum time of 10 sec. RL54 is energized. The time is adjustable by means of the potenziometer RV51 and is fixed around the 2 sec.

10. PROTEZIONI LENTE DI TENSIONE - ALI 030

10.1. Schema elettrico

10. ALI 030 VOLTAGE SLOW PROTECTIONS

10.1. Electric diagram

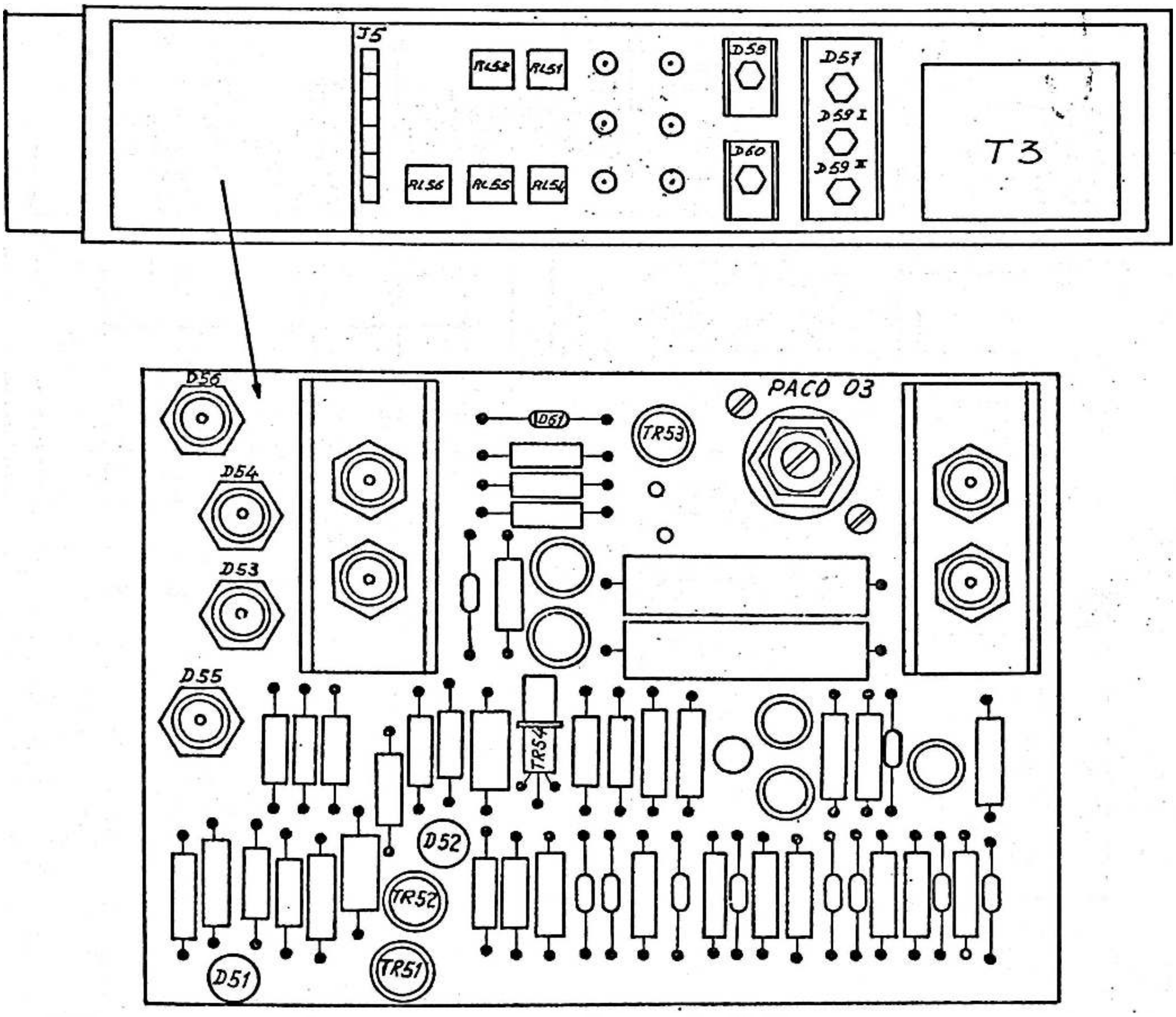


10.2. Disposizione Componenti

ALI 030 - Pacco e Piastrina PACO 03

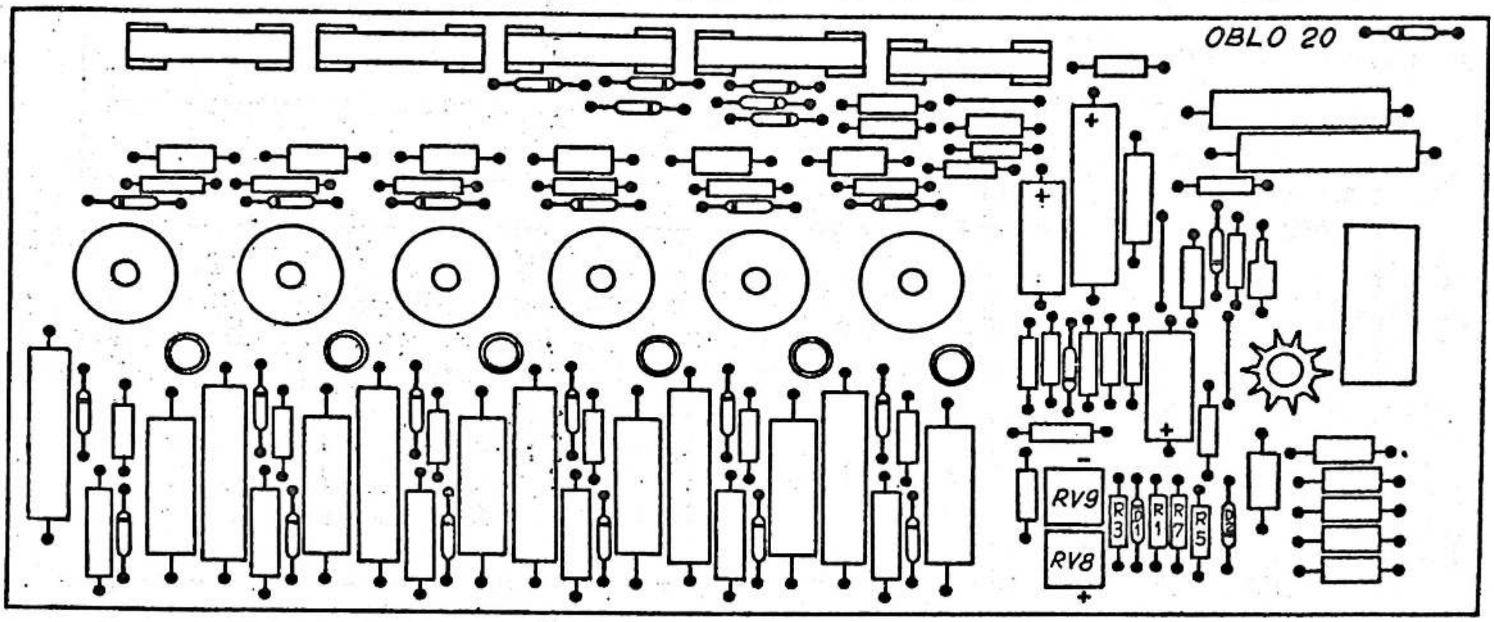
10.2. Topographic arrangement of components

ALI 030 - Module and PACO 03 board



ALI 031 - Piastrina OBLO 20

ALI 031 - OBLO 20 board



10.3. Riferimento documentazione

10.3. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento documentazione
Interested elementary unit	Drwg. No.	Documentation reference
ALI 030 ALI 031	14431010 14431305	Alimentatore Power supply

10.4. Tabella componenti

10.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
A-B-C-D	ALI 030	A-B-C-D sono ponticelli. A-B si inseriscono per desensibilizzare la protezione di tensione (28 ÷ 35%). C-D sono montati qualora l'alimentatore sia composto da tre o più unità di potenza.
		A-B-C-D are strappings. A-B are inserted to annul the voltage protection (28 ÷ 35%). C-D are assembled when the power supply consists of 3 or more power units.
C51 ÷ C59	ALI 030	Condensatori di livellamento dell'alimentatore del circuito di protezione.
		Power supply leveling capacitors of the protection circuit.
D1 - D2	ALI 031	Diodi di disaccoppiamento: sono montati sulla piastra degli oscillatori bloccati OBLO 20
		Uncoupling diodes: they are assembled on the board of the blocked oscillators OBLO 20
D51 ÷ D62	ALI 030	Diodi del circuito di protezione e del relativo circuito di alimentazione
		Diodes of the protection circuit and the related power supply circuit.
F51 ÷ F52	ALI 030	Fusibili montati dal lato canale cavi
		Fuses assembled on the cables channel side

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
RL1	ALI 031	Contatto del relé RL1 che si chiude premendo il pulsante "ON" su ALI 030. Il relé RL1 rimane eccitato in condizione di normale funzionamento. Contact of the relay RL1 which closes pressing the "ON" key on the ALI 030. The RL1 relay stays energized in normal performance conditions.
RL51 ÷ RL52	ALI 030	Si eccitano premendo il pulsante "ON" su ALI 030, se le tensioni di uscita raggiungono i valori nominali. Restano eccitati in condizione di normale funzionamento. They are energized pressing the "ON" key on the ALI 030, if the output voltages reach the nominal values. They stay energized in normal performance conditions.
R1 ÷ R7	ALI 031	Resistenze dei partitori montate sulla piastra OBLO 20 Resistances of the breakers assembled on the OBLO 20 board.
RV8 – RV9	ALI 031	Potenziometri montati sulla piastra OBLO, vengono impiegati per la taratura del circuito di protezione. Potenziometers assembled on the OBLO board, are used to adjust the protection circuit.

Componenti in ordine alfabetico o numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
S4 - S5	ALI 031	Breakers. Posizionati in "ON", consentono l'erogazione del +20V. Posizionati in "OFF" interrompono l'erogazione del +20V verso l'esterno. Si portano automaticamente in "OFF" in caso di corto circuito o sovraccarico sul circuito esterno. Breakers. Positioned on "ON", they allow the supplying of +20V. Positioned on "OFF" interrupt the supplying of +20V towards the outside. They move automatically on "OFF" in case of short circuit or overloading on the external circuit.
J4 - J5	ALI 030	Connettori Connectors

10.5. Sequenza di controlli per la verifica dell'efficienza del circuito di protezione ALI 030

1) Controllare le alimentazioni misurando la tensione sui componenti sotto specificati: (le tensioni sono riferite alla massa)

ANODO	DIODO D57	-22V	±1,5V
CATODO	DIODO D58	+22V	±1,5V
ANODO	DIODO D59	-10V	±0,5V
CATODO	DIODO D60	+10V	±0,8V

10.5. Sequence of controls to check the efficiency of the ALI 030 PROTECTION CIRCUIT.

1) Check the supplies measuring the voltage on the components specified below (the voltages are referred to the ground):

ANODE	DIODE D57	-22V	±1,5V
CATHODE	DIODE D58	+22V	±1,5V
ANODE	DIODE D59	-10V	±0,5V
CATHODE	DIODE D60	+10V	±0,8V

2) Su ALI 031 agire sul potenziometro RV1 "VOLTAGE ADJUST", portare la tensione d'uscita oltre i 22 V (+ 10%) e verificare che si rilasci il relé RL51 determinando lo spegnimento dell'alimentatore.

3) Su ALI 031 agire sul potenziometro RV1 "VOLTAGE ADJUST", portare la tensione d'uscita al di sotto di + 18V (- 10%) e verificare che si rilasci il relé RL52, determinando lo spegnimento dell'alimentatore.

Le operazioni 2 e 3 sono effettuabili se non sono montati i ponticelli di par. 5.2, ossia con alimentatore su carico di macchina.

SEQUENZA DI CONTROLLI PER VERIFICARE L'EFFICIENZA DEL CIRCUITO DI PROTEZIONE DI TENSIONE SCR

10.6. Taratura dei partitori della protezione di tensione sull'unità SCR

(eseguibile se non sono montati i ponticelli di par. 5.2).

La taratura della protezione di tensione deve consentire:

- Intervento della protezione per sbandamenti della tensione +20 V verso il +
- Intervento della protezione per sbandamenti della tensione +20 V verso il -

1) Taratura del partitore ramo positivo.

Sull'ALI 031 agire sul potenziometro VU "VOLTAGE ADJUST" portan

2) On the ALI 031 act on the potenziometer RV1 "VOLTAGE ADJUST", bring the output voltage beyond the 22V (+10%) and check that the relay RL51 is released determining the switching off of the power supply.

3) On the ALI 031 act on the potenziometer RV1 "VOLTAGE ADJUST", bring the output voltage beyond +18 V (-10%) and check that the relay RL52 is released, determining the switching off of the power supply.

Operations 2 and 3 may be performed if the strapping mentioned in par. 5.2. are not assembled.

SEQUENCE OF CONTROLS TO CHECK THE EFFICIENCY OF THE SCR VOLTAGE PROTECTION CIRCUIT

10.6. Adjustment of the breakers of the SCR unit voltage protection

(which may be performed if the strappings of par.5.2 are not assembled).

The adjustment of the voltage protection must allow:

- Intervention of the protection for +20 V voltage variations towards the +
- Intervention of the protection for +20 V voltage variations towards the -

1) Adjustment of the positive branch of the breaker.

On the ALI 031 act on the potenziometer VU "VOLTAGE ADJUST" bringing do la tensione di uscita a +22 V. Qualora la protezione di tensione intervenisse prima di raggiungere tale valore di tensione, ruotare di alcuni giri in senso antiorario la vite di regolazione del potenziometro RV8. Successivamente riprendere la regolazione del potenziometro VU fino a raggiungere la tensione richiesta. Con la tensione in uscita a +22 V, ruotare lentamente in senso orario la vite di regolazione del potenziometro RV8 fino a determinare l'intervento della protezione di tensione, con conseguente spegnimento dell'alimentatore. In queste condizioni la protezione è tarata per intervenire con sbandamenti della tensione di uscita del 10% verso il +.

2) Taratura del partitore ramo negativo.

Agire sul potenziometro VU "VOLTAGE ADJUST", portando la tensione d'uscita a + 18V.(Qualora la protezione di tensione intervenisse prima di raggiungere tale valore di tensione, ruotare di alcuni giri in senso antiorario la vite del potenziometro RV9. Successivamente riprendere la regolazione del potenziometro VU fino a raggiungere la tensione richiesta. Con la tensione in uscita a +18 V ruotare lentamente in senso orario la vite di regolazione del potenziometro RV9 fino a determinare l'intervento della protezione di tensione con conseguente spegnimento dell'alimentatore. In queste condizioni la protezione è tarata per intervenire con sbandamenti della tensione d'uscita del

the output voltage to +22 V. Should the voltage protection intervene before reaching such a voltage value, rotate of some turns, counter clockwise, the adjustment screw of the RV8 potenziometer. Successively, start again the adjustment of the VU potenziometer until the required voltage is reached. With the output voltage at +22 V, rotate slowly, clockwise, the adjustment screw of the RV8 potenziometer to cause the voltage protection intervention, with subsequent switching off of the power supply. In these conditions the protection is adjusted to intervene for output variations of 10% towards the +.

2) Adjustment of the negative branch of the breaker.

Act on the potenziometer VU "VOLTAGE ADJUST", bring the output voltage to +18V. Should the voltage protection intervene before reaching such a voltage value, rotate of same turns, counter-clockwise, the screw of the potenziometer RV9. Successively, re-start the adjustment of the VU potenziometer until the required voltage is reached. With the output voltage at +18 V, rotate slowly the adjustment screw of the potenziometer RV9 to cause the voltage protection intervention with subsequent switching off of the power supply. In these conditions the protection is adjusted to intervene for output voltage variations of 10% towards the - . In any case, rotating clockwise the screws of the potenziometers RV8 - RV9 the protection is made more sensitive and it is made less

10% verso il -.

In ogni caso, ruotando in senso orario le viti dei potenziometri RV8-RV9 si sensibilizza la protezione, viceversa, ruotando le viti in senso antiorario.

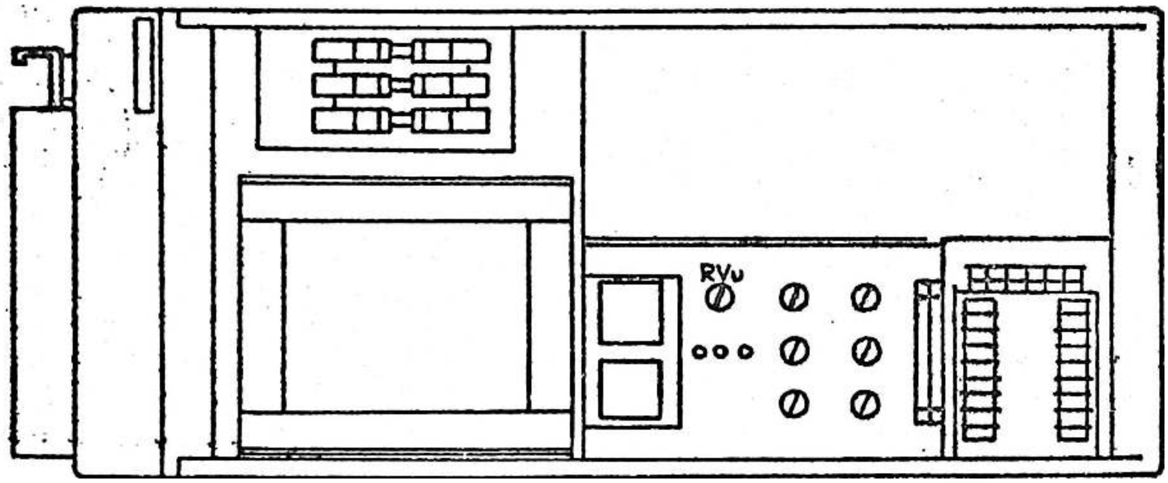
sensitive by rotating the screws counter-clockwise.

10.6.1 Disposizione potenziometri (ALI 031)

10.6.1. Potenziometers disposition (ALI 031)

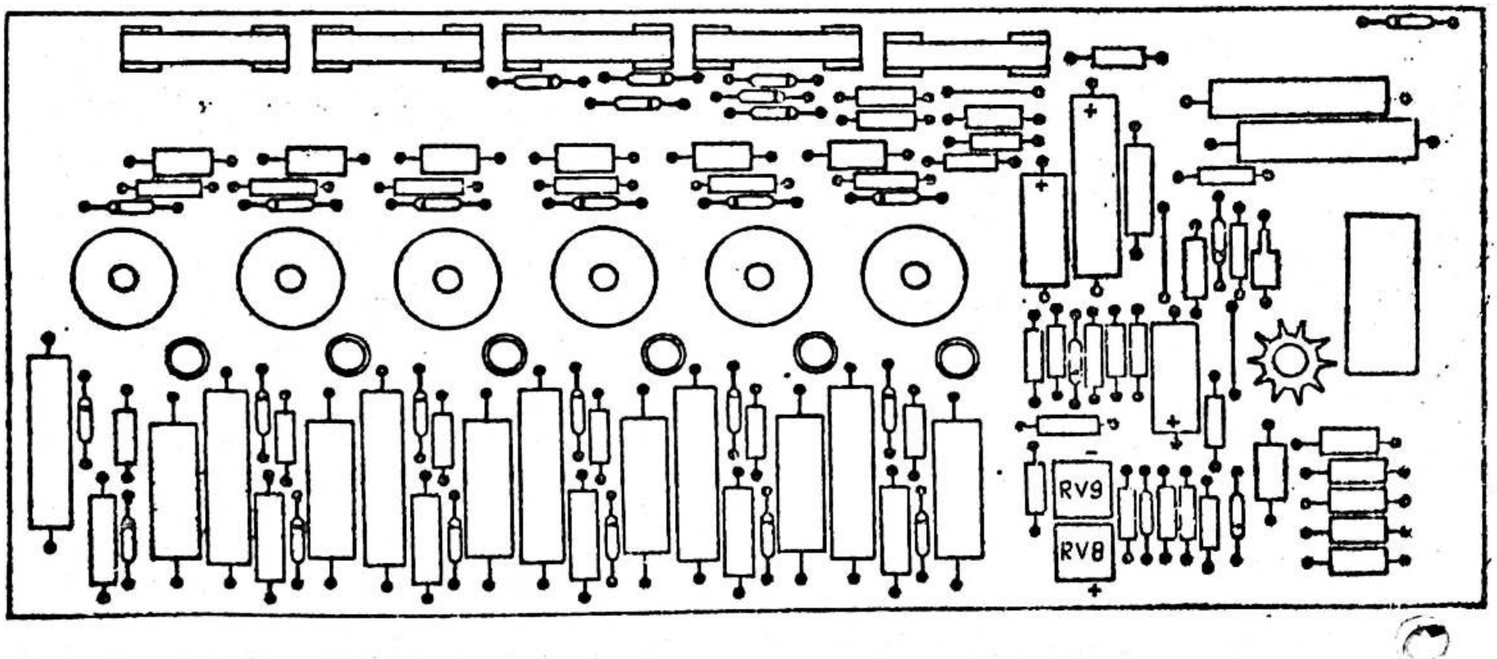
Potenziometro RVu

RVu Potentiometer



Piastrina OBLO 20 - Potenziometri RV8 - RV9

OBLO 20 Board - RV8 - RV9 Potentiometers

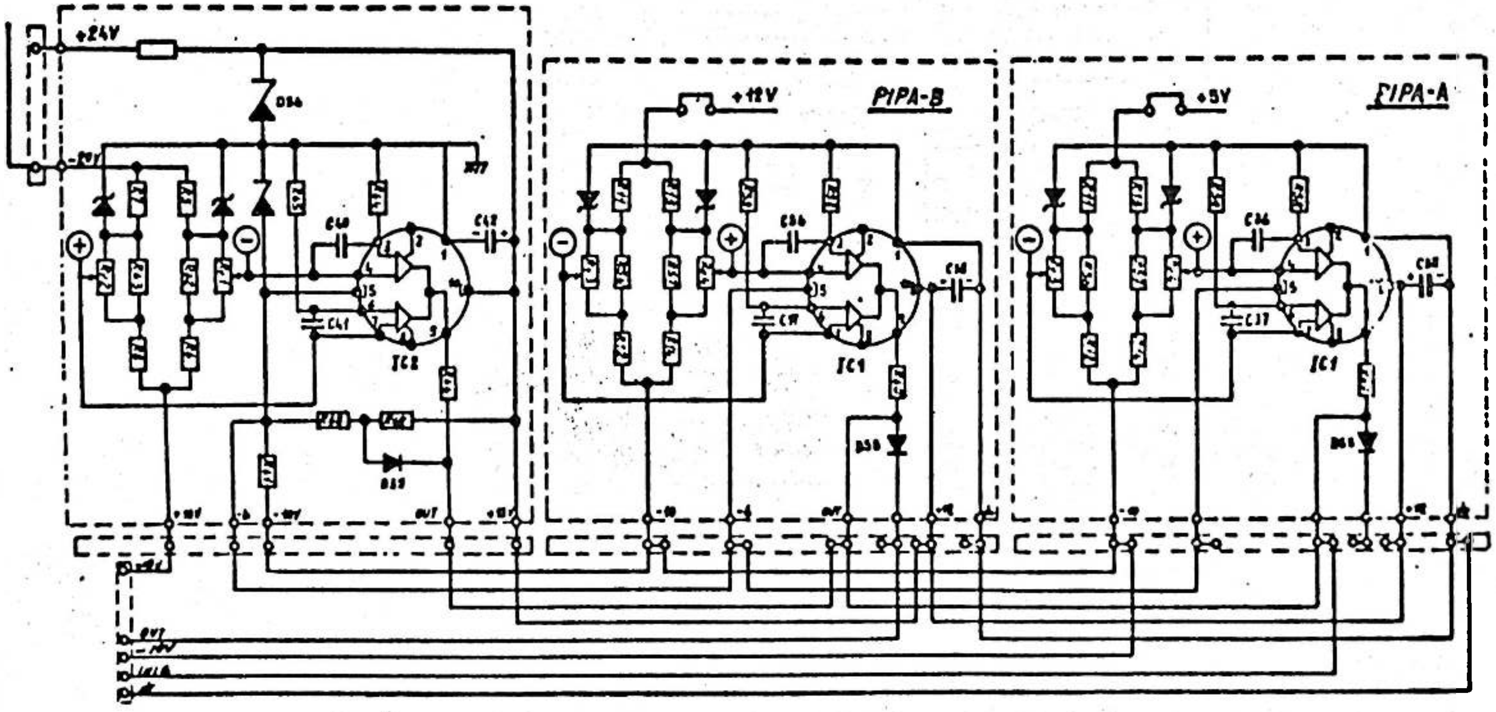


11. FROTEZIONI LENTE DI TENSIONE - ALI 150

11. SLOW VOLTAGE PROTECTIONS - ALI 150

11.1. Schema elettrico

11.1. Electric diagrams

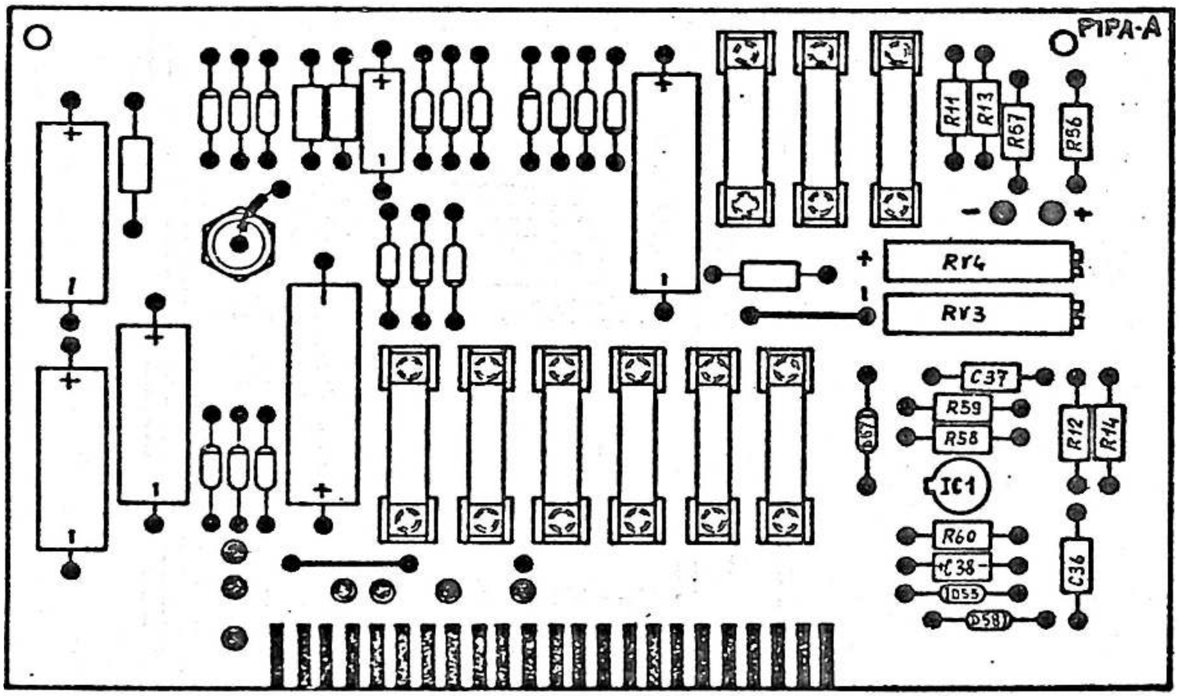


11.2. Disposizione topografica componenti

Piastrina PIPA - A

11.2. Topographic disposition of the components

PIPA - A Board

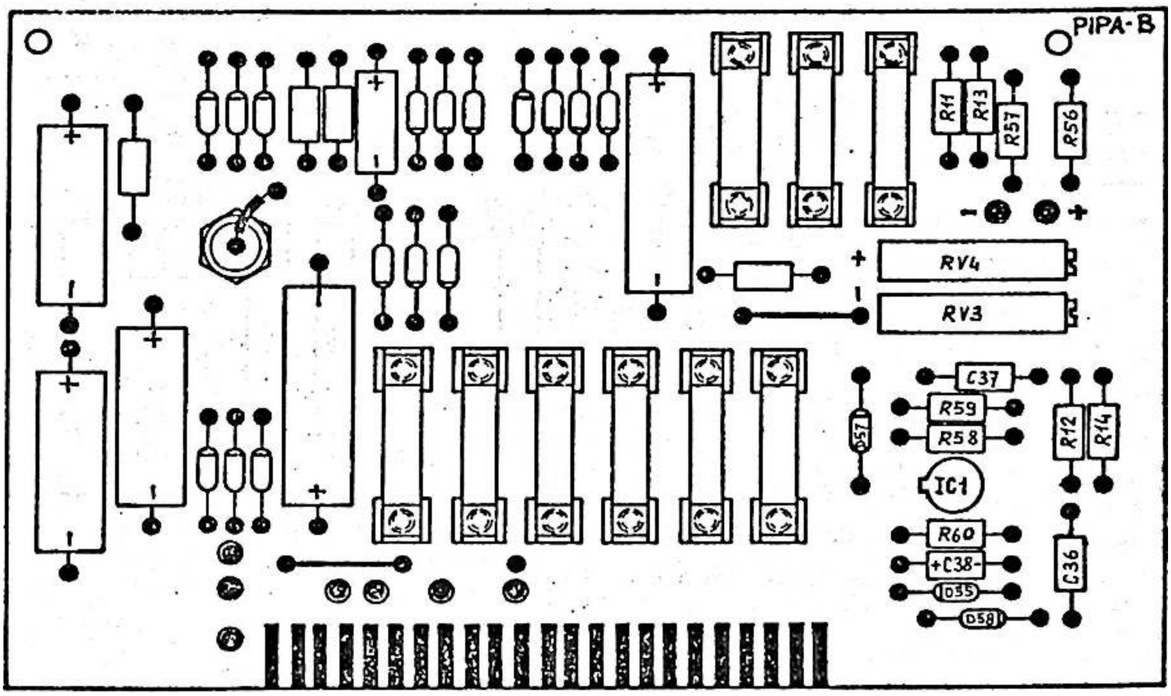


Disposizione topografica componenti

Piastrina PIPA - B

Topographic disposition of the components

PIPA - B Board

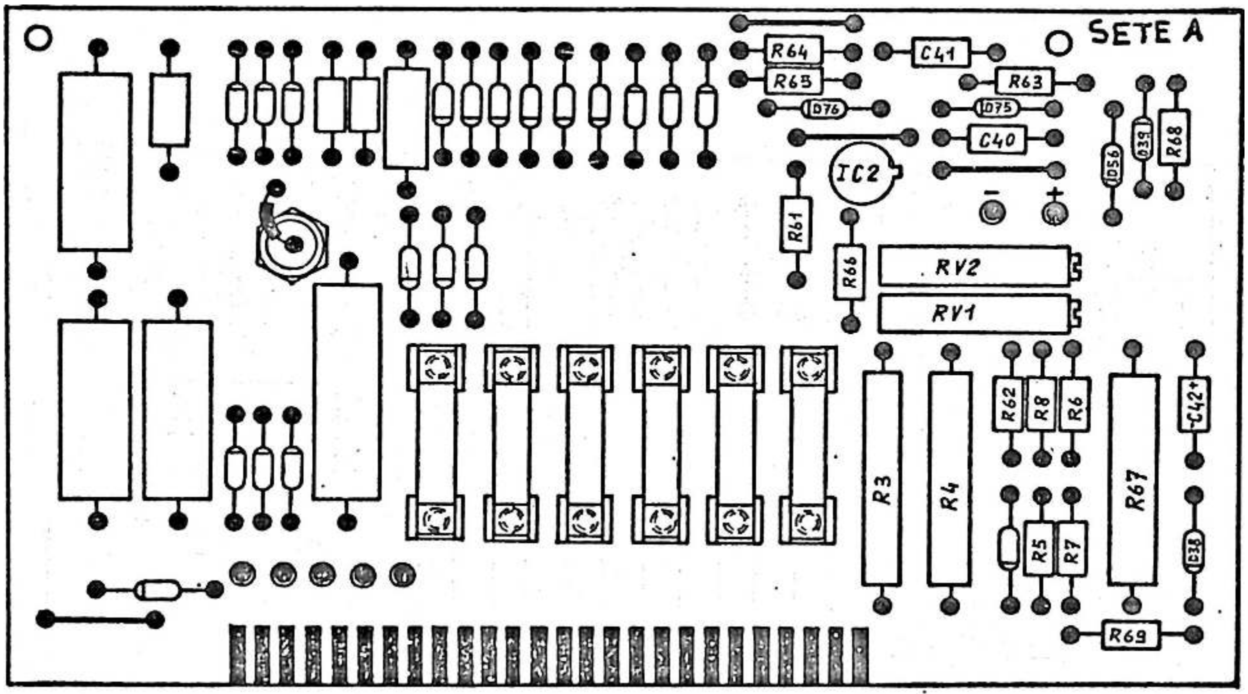


Disposizione topografica componenti

Piastrina SETE - A

Topographic disposition of the components

SETE - A Board



11.3. Riferimento documentazione

11.3. Documentation reference

Unità elementari interessate	N° Disegno	Riferimento Documentazione
Interested elementary units	Drwg. No.	Documentation reference
ALI 150 - PACCO Trasformatore	14432012	Alimentatore Power supply

11.4. Tabella componenti

11.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary units	Logic and electric functions
C36–C37	ALI 150 P.TR.	Condensatori – Piastrina PIPA
		Capacitors – PIPA board
C40–C41	ALI 150 P.TR.	Condensatori – Piastrina SETE
		Capacitors – SETE board
C38–C42	ALI 150 P.TR.	Condensatori filtro +12V – Piastrine PIPA e SETE
		+12 V filter capacitors – PIPA and SETE board
D38	ALI 150 P.TR.	Diodo Zener –6V – Piastrina SETE
		–6V Zener Diode – SETE board
D39	ALI 150 P.TR.	Diodo separatore – Piastrina SETE
		Separator diode – SETE board
D55	ALI 150 P.TR.	Diodo disaccoppiamento d'uscita – Piastrina PIPA
		Output uncoupling diode – PIPA board
IC1–IC2	ALI 150 P.TR.	Doppio amplificatore differenziale integrato – Piastrine PIPA e SETE
		Double integrated differential amplifier – PIPA and SETE boards
R5 ÷ R7	ALI 150 P.TR.	Resistenze partitori – Piastrina SETE
		Breakers resistances – SETE board

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary units	Logic and electric functions
R11 ÷ R14	ALI 150 P.TR.	Resistenze partitori - Piastrina PIPA
		Breakers resistances - PIPA board
R56 ÷ R57	ALI 150 P.TR.	Resistenze partitori - Piastrina PIPA
		Breakers resistances - PIPA board
R58 ÷ R59	ALI 150 P.TR.	Resistenze - Piastrina PIPA
		Resistances - PIPA board
R 60	ALI 150 P.TR.	Resistenza uscita IC1 - Piastrina PIPA
		IC1 output resistance - PIPA board
R 61	ALI 150 P.TR.	Resistenza Zener D38 - Piastrina SETE
		D38 Zener resistance - SETE board
R62 ÷ R63	ALI 150 P.TR.	Resistenze partitori - Piastrina SETE
		Breakers resistances - SETE board
R64 ÷ R65	ALI 150 P.TR.	Resistenze - Piastrina SETE
		Resistances - SETE board
R 66	ALI 150 P.TR.	Resistenza uscita IC2 - Piastrina SETE
		IC2 output resistance - SETE board
R 67	ALI 150 P.TR.	Resistenza Zener D56 - Piastrina SETE
		D56 Zener resistance - SETE board

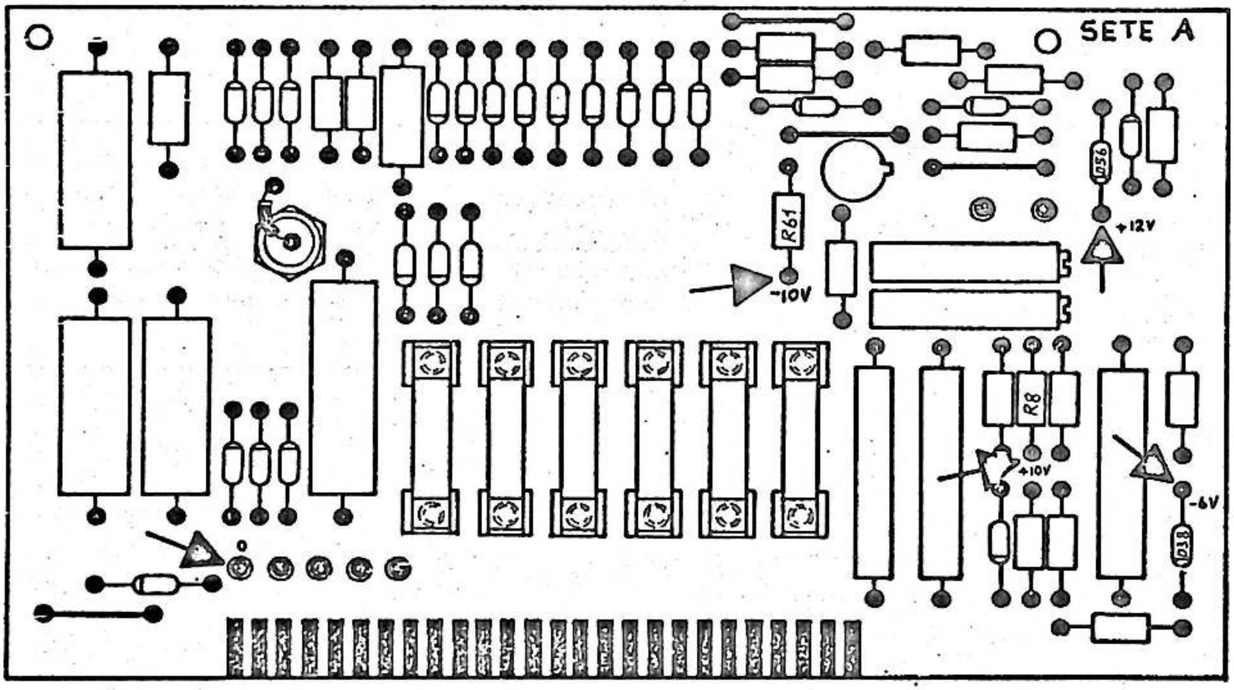
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary units	Logic and electric functions
R68 ÷ R69	ALI 150 P.TR.	Partitore - Piastrina SETE
		Breaker - SETE board
RV1 - RV3	ALI 150 P.TR.	Potenziometri di regolazione della soglia di intervento per diminuzione della tensione di uscita - Piastrine SETE e PIPA
		Adjustment potentiometers of the intervention thereshold to decrease the output voltage - PIPA and SETE boards
RV2 - RV4	ALI 150 P.TR.	Potenziometri di regolazione della soglia di intervento per aumento della tensione d'uscita - Piastrine SETE e PIPA.
		Adjustment potentiometers of the intervention threshold to increase the output voltage - SETE and PIPA boards.

11.5. Sequenza di controlli per verificare l'efficienza dei circuiti delle protezioni lente di tensione di ALI 150

1) Controllare le tensioni + 10 V e -10V di riferimento, fornite dall'ALI 030 rispettivamente sulle resistenze R8 e R61, misurate rispetto allo -0- delle tensioni ausiliarie sulla piastrina SETE A (vedi figura)

11.5. Sequence of controls to check the efficiency of the circuits of the slow voltage protections of ALI 150

1) Check the +10V and -10V reference voltages, supplied by ALI 030 respectively to resistances R8 and R61, measured with respect to the 0 of the auxiliary voltages on the SETE A board (refer to fig.)



2) Controllare che le tensioni sul catodo del diodo D56 e sull'anodo del diodo D38, misurate rispetto allo "0" delle tensioni ausiliarie, siano rispettivamente +12V e -6V ± 5%.

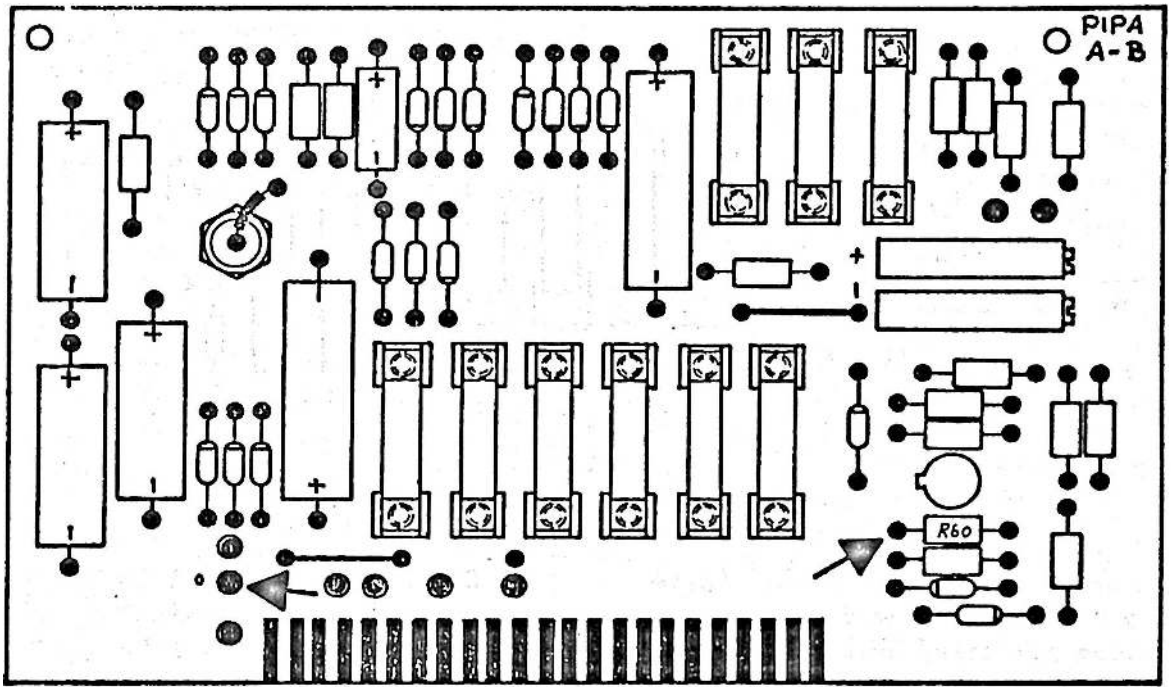
2) Check that the voltages on the cathode of the D56 diode and on the anode of the D38 diode, measured with respect to the "0" of the auxiliary voltages, be respectively +12V and -6V ± 5%.

3) Con le tensioni al valore nominale, misurare le uscite dei circuiti differenziali integrati.

Sulle piastrine PIPA-A-B tra R60 (+) e la boccolina OV.

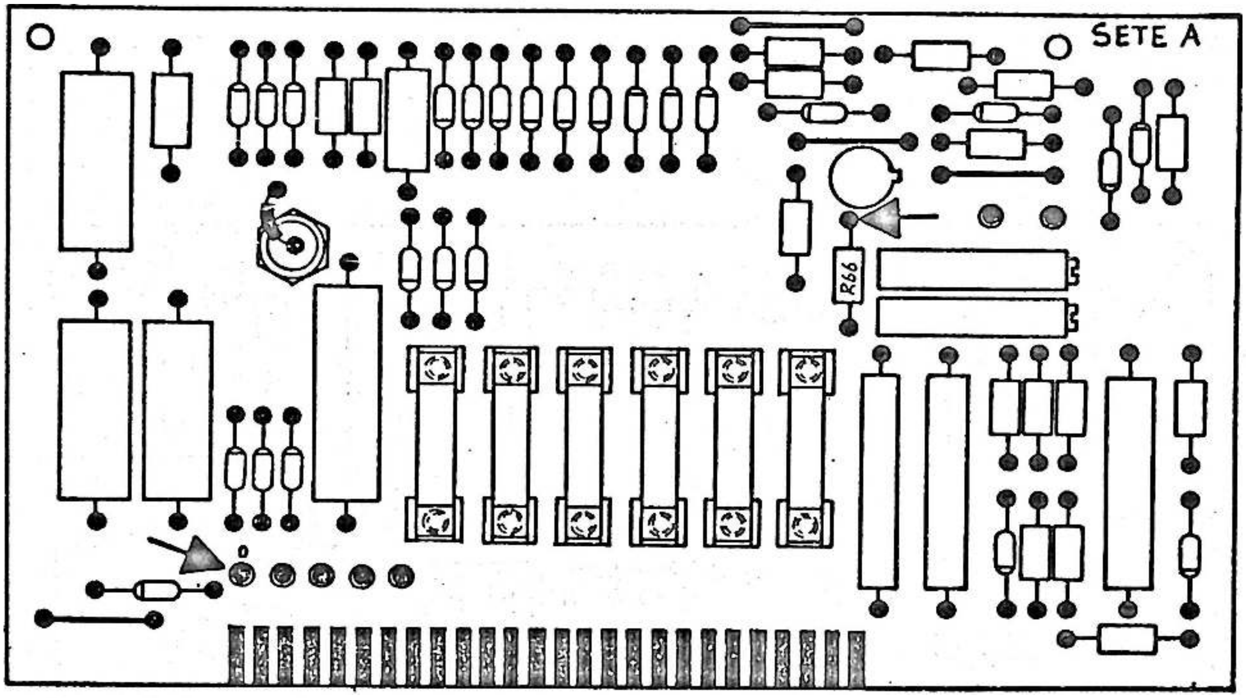
3) With the voltages at the nominal value, measure the outputs of the integrated differential circuits.

On the PIPA-A-B boards between R60 (+) and the test point OV.



Sulla piastrina SETE tra R66 (+) e la boccolina OV.

On the SETE board between R66 (+) and the test point OV.



4) Rilevandosi una uscita alta (3,5÷5,5 V) con tensione d'uscita al valore nominale, desensibilizzare i due partitori relativi al circuito in esame, ruotando il potenziometro RV2 per la piastrina SETE o RV4 per la piastrina PIPA-A-B completamente in senso orario, e il potenziometro RV1 per la piastrina SETE o RV3 per le piastrine PIPA-A-B completamente in senso antiorario.

5) Se l'uscita permane alta, sostituire il relativo circuito integrato.

6) Tarare le protezioni come indicato in par. 11.6.

4) Should a high output (3,5÷5,5 V) be noted with an output voltage at the nominal value, make the two breakers related to the circuit under exam not sensitive, rotating the potenziometer RV2 for the SETE board or RV4 for the PIPA-A-B board completely clockwise, and the potenziometer RV1 for the SETE board or RV3 for the PIPA-A-B board completely counter-clockwise.

5) If the output is still high, replace the related integrated circuit.

6) Adjust the protections as indicated on para. 11.6.

11.6. Taratura dei partitori della protezione lenta di tensione sull'unità ALI 150

La taratura è possibile se non sono montati i ponticelli di par.11.7.

1) Ruotare il potenziometro RV2 (piastrina SETE A) e i potenziometri RV4 (Piastrine PIPA-A e PIPA-B) completamente in senso orario.

2) Ruotare il potenziometro RV1 (piastrina SETE-A) e i potenziometri RV3 (piastrine PIPA-A e PIPA-B) completamente in senso antiorario.

Disposizione dei potenziometri sulla piastrina SETE-A.

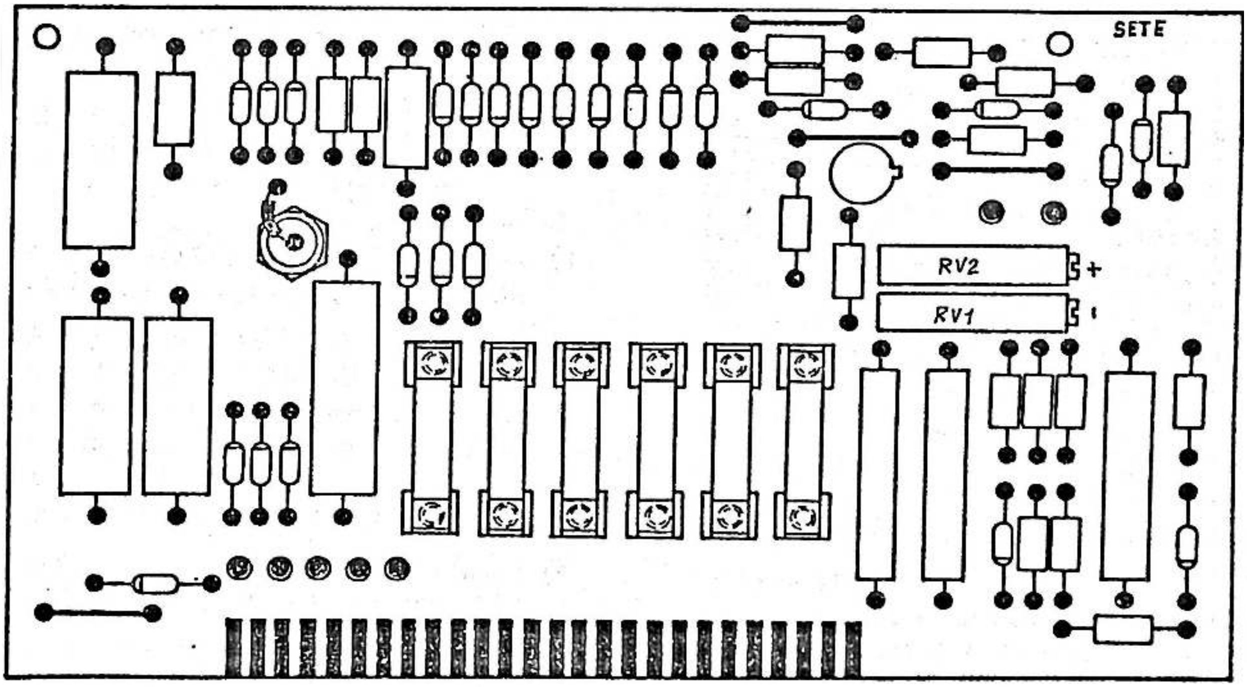
11.6. Adjustment of the breakers of the slow voltage protection on the ALI 150 unit

The adjustment is possible if the strappings of par.11.7 are not assembled.

1) Rotate the RV2 potenziometer(SETE A board) and the RV4 potenziometers (PIPA-A and PIPA-B boards) completely clockwise.

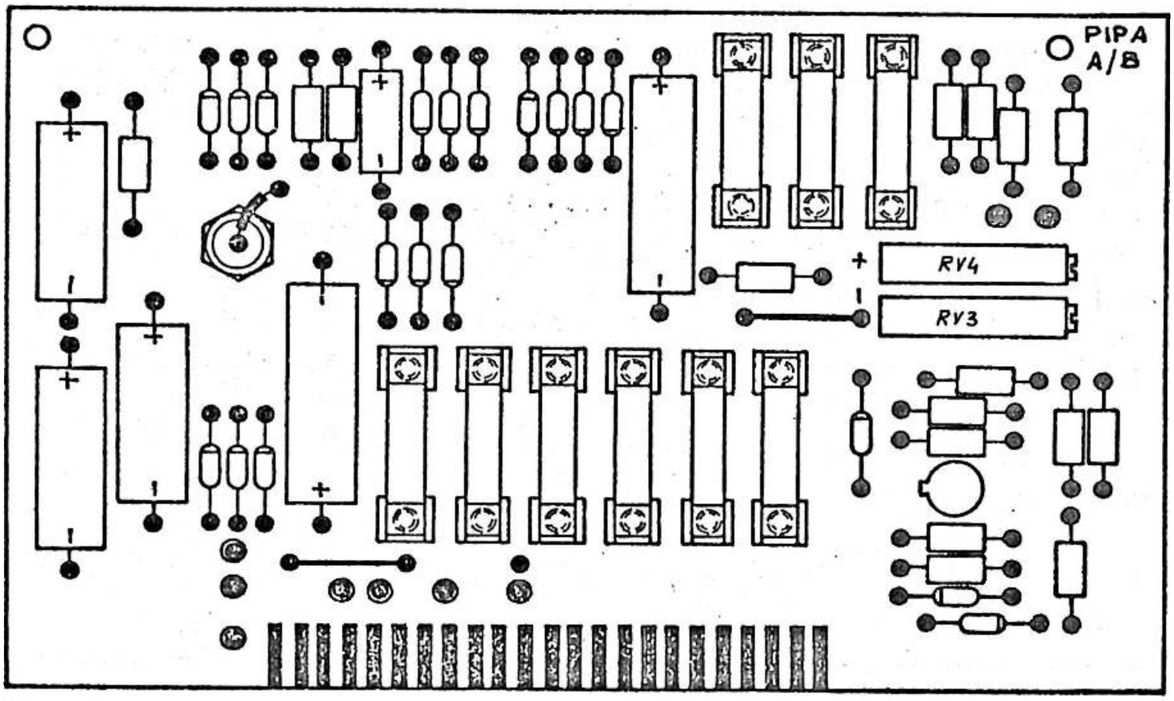
2) Rotate the RV1 potenziometer(SETE A board) and the potenziometers RV3 (PIPA-A and PIPA-B boards)completely counter-clockwise.

Disposition of the potenziometers on the SETE-A board.



Disposizione dei potenziometri sulle piastrine PIPA-A e PIPA-B

Disposition of the potentiometers on the PIPA-A and PIPA-B boards.



11.6.1. Taratura limite intervento superiore della tensione +5V

1) Variare la tensione +5V del +8% (tramite RV5 - VOLTAGE ADJ.), portandola a + 5,4 V.

2) Ruotare in senso antiorario il potenziometro RV4 della piastrina PIPA-A, sino a quando non si provoca l'intervento della protezione, con conseguente spegnimento dell'alimentatore (attraverso l'intervento di ALI 030).

3) Ruotare leggermente il potenziometro RV5 "VOLTAGE ADJ." del box +5V in senso antiorario.

4) Accendere l'alimentatore, ed agendo ancora su RV5, controllare la soglia fissata. Se questa non cor

11.6.1. Adjustment of the upper intervention limit of the +5V voltage

1) Vary the +5V of +8% (through RV5-VOLTAGE ADJ.) bringing it to 5,4V.

2) Rotate counter-clockwise the RV4 potentiometer of the PIPA-A board, until the protection intervention is caused, with subsequent switching off of the power supply (through the ALI 030 intervention).

auf PIPA-A Pin 20 ca auf 2,5V steigt.

3) Rotate slightly the potentiometers RV5 "VOLTAGE ADJ." of the box +5V counter-clockwise.

4) Turn the power supply on, and acting again on RV5, check the fixed threshold. If this does not correspond exactly, adjust RV4 until

risponde esattamente, ritoccare RV4 fino ad avere il giusto intervento della protezione.

5) Riportare la tensione di uscita al suo valore nominale +5V.

11.6.2. Taratura limite di intervento inferiore della tensione + 5V

1) Variare la tensione +5V del - 8% portandola a + 4,6 V.
2) Ruotare in senso orario il potenziometro RV3 della piastrina PIPA A sino a provocare l'intervento della protezione, con conseguente spegnimento dell'alimentatore.
3) Ruotare leggermente il potenziometro RV5 "VOLTAGE ADJ." in senso orario.
4) Accendere l'alimentatore, ed agendo ancora su RV5, controllare la soglia fissata. Se questa non corrisponde, ritoccare RV3 fino ad avere il giusto intervento della protezione.
5) Riportare la tensione d'uscita al suo valore nominale.

11.6.3. Taratura limite intervento superiore della tensione +12V

Si procede come descritto per la tensione +5 V, tenendo presente che:

1) Il potenziometro RV4 relativo alla tensione +12V è sulla piastrina PIPA-B.
2) Il limite di intervento è +12,96V (+ 8%).

the protection intervenes at the right moment.

5) Bring the output voltage back to its nominal value + 5V.

11.6.2. Adjustment of the lower intervention limit of the +5V voltage

1) Vary the +5V voltage of -8%, bringing it to +4,6 V.
2) Rotate clockwise the potentiometer RV3 of the PIPA-A board until the intervention protection is caused, with subsequent switching off of the power supply.
3) Rotate slightly the potentiometer RV5 "VOLTAGE ADJ." clockwise.
4) Turn the power supply on, and acting again on the RV5, check the fixed threshold. If this does not correspond, adjust RV 3 until the right protection intervention is obtained.
5) Bring back the output voltage to its nominal value.

11.6.3. Adjustment of the upper intervention limit of the +12V voltage

The procedure is the same as the one described for the +5V voltage, keeping in mind that:

1) The RV4 potentiometer related to the +12V voltage is on the PIPA-B board.
2) The intervention limit is +12,96V (+8%).

11.6.4. Taratura limite di intervento inferiore della tensione +12 V

Si procede come descritto per la tensione +5V tenendo presente che:

1) Il potenziometro RV3 relativo alla tensione +12V è sulla piastrina PIPA-B.
2) Il limite di intervento è +11,04V (-8%).

11.6.5. Taratura limite di intervento superiore della tensione - 20V

Si procede come per la tensione +5V tenendo presente che:

1) Il potenziometro per la regolazione del limite di taratura superiore è RV2 sulla piastrina SETE-A.
2) Il limite di intervento è - 21,6 V (+8%).

11.6.6. Taratura limite di intervento inferiore della tensione - 20V

Si procede come per la tensione +5V tenendo presente che:

1) Il potenziometro per la regolazione del limite di taratura inferiore è RV1 sulla piastrina SETE-A.
2) Il limite di intervento è -18,4 V (-8%).

11.6.4. Adjustment of the lower intervention limit of the +12V voltage

The procedure is the same as the one given for the +5V, keeping in mind that:

1) The RV3 potentiometer relative to the +12V is on the PIPA-B board.
2) The intervention limit is +11,04V (-8%).

11.6.5. Adjustment of the upper intervention limit for the -20V voltage

The procedure is the same as the one given for +5V keeping in mind that:

1) The potentiometer for the adjustment of the upper adjustment limit is RV2 on the SETE-A board.
2) The intervention limit is -21,6V (+8%).

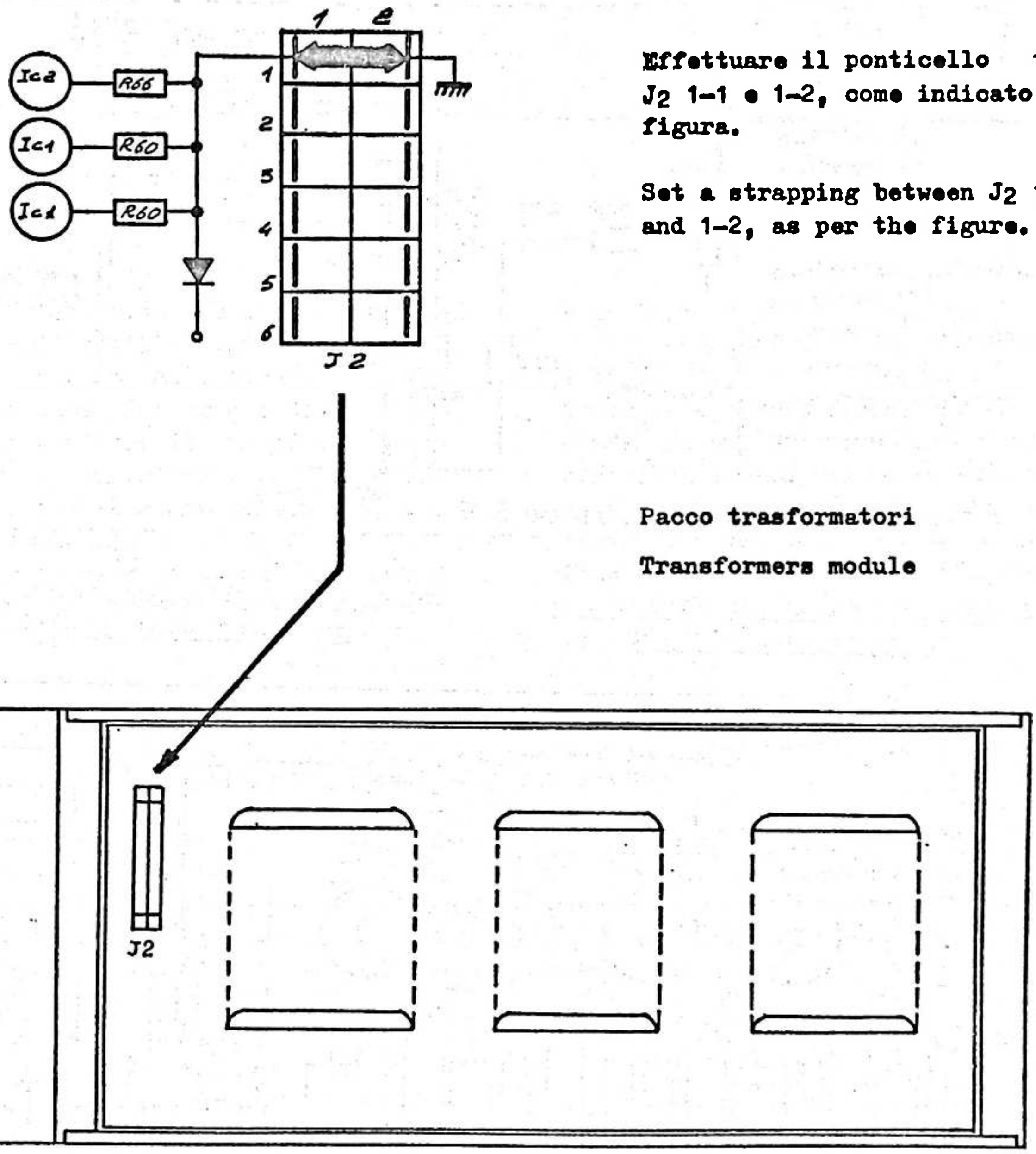
11.6.6. Adjustment of the lower intervention limit for the -20V voltage

The procedure is the same as the one given for +5V keeping in mind that:

1) The potentiometer for the adjustment of the lower adjustment limit is RV1 on the SETE-A board.
2) The intervention limit is -18,4V (-8%).

11.7. Desensibilizzazione delle protezioni lente di tensione su ALI 150

11.7. Making the slow voltage protections on the ALI 150 not sensitive



Effettuare il ponticello tra J2 1-1 e 1-2, come indicato in figura.

Set a strapping between J2 1-1 and 1-2, as per the figure.

Pacco trasformatori

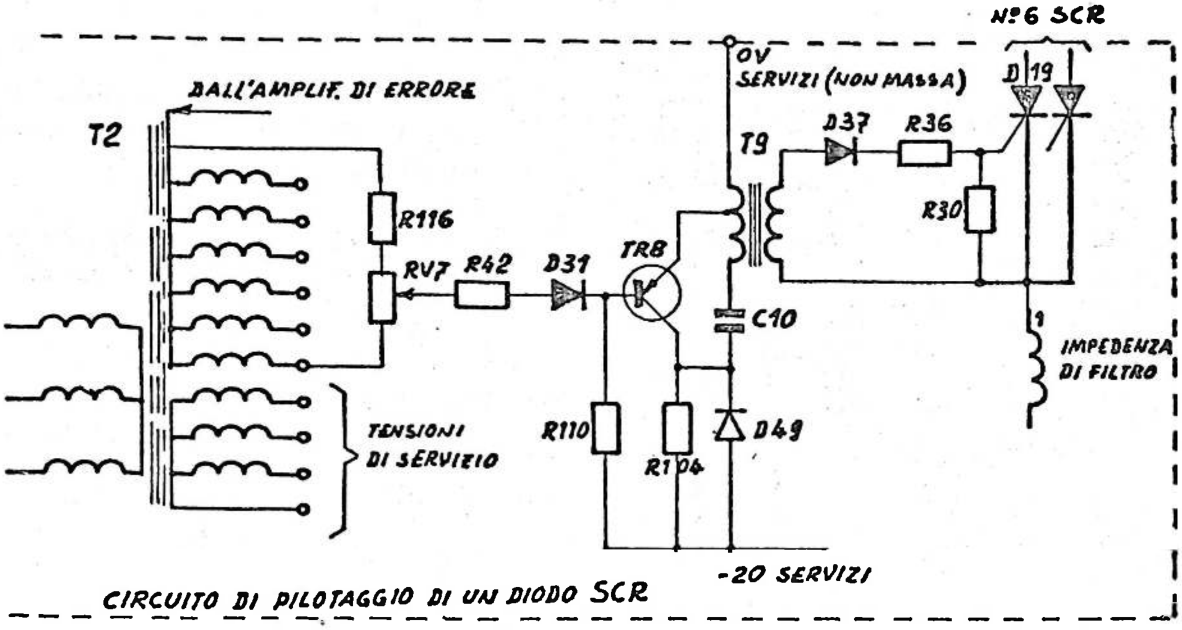
Transformers module

12. ALIMENTATORE SCR
CIRCUITO DI PILOTAGGIO DI UN DIODO SCR

12. SCR POWER SUPPLY
DRIVING CIRCUIT OF A SCR DIODE

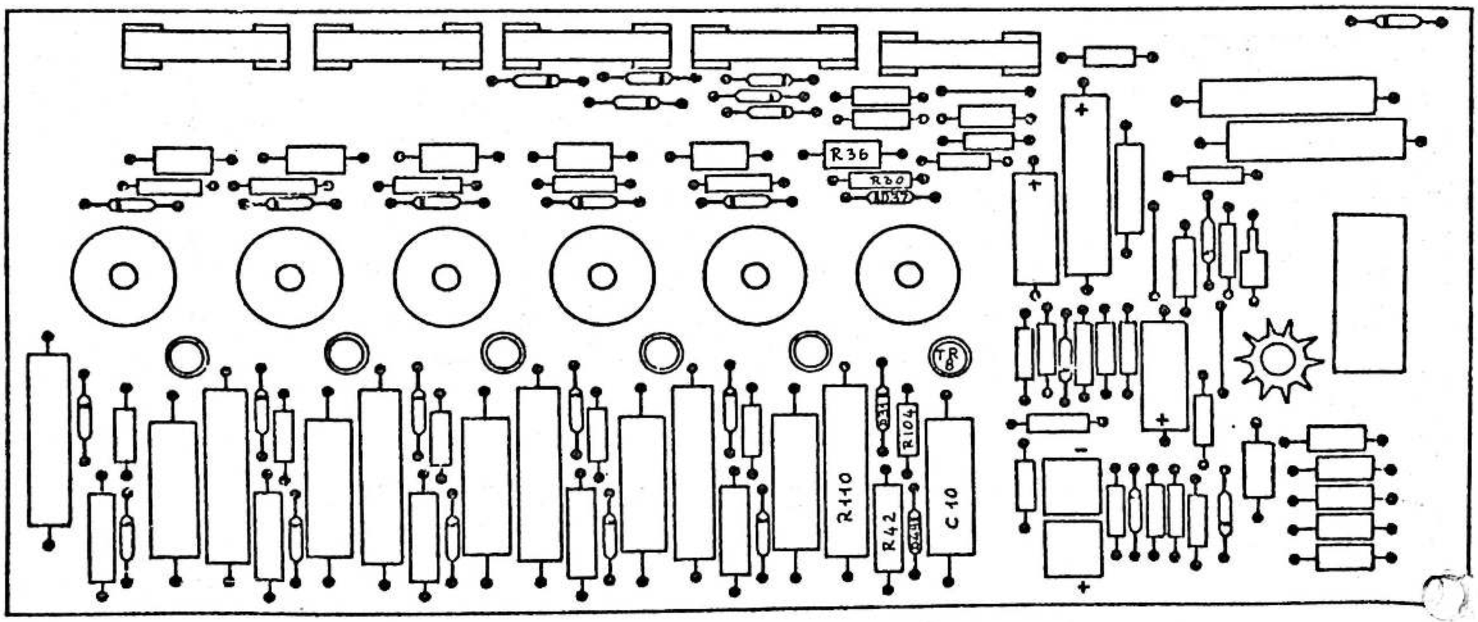
12.1. Schema elettrico

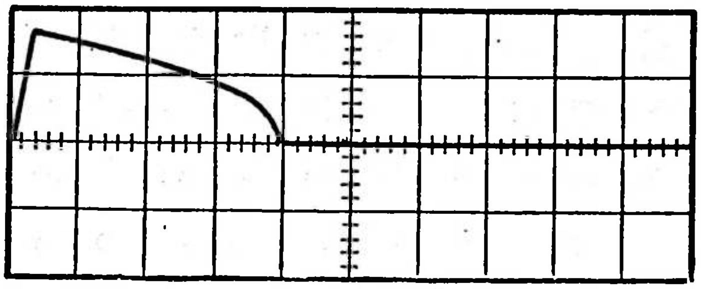
12.1. Electric diagram



12.2. Disposizione topografica componenti su piastra OBLO -20

12.2. Topographic disposition of the components on the OBLO -20 board





Scale Probe attenuato

0,5V/cm Sincr. interno +
10 µs/cm

Forma d'onda rilevata collegando la massa dell'oscilloscopio al punto 1 della impedenza di filtro ed il probe sul circuito di gate del diodo SCR. Per non caricare il circuito di gate e rendere più uniformi le rilevazioni, la misura è stata effettuata col gate scollegato
(Gli ingressi di gate dei 6 diodi SCR fanno capo a due morsettiere dell'ALI 031: P5-P6).

Wave form detected connecting the oscilloscope ground wire to the point 1 of the filter impedence and the probe on the gate circuit of the SCR diode. In order not to load the gate circuit and make the measures more uniform, this measure was taken with the gate disconnected.
(The gate inputs of the 6 SCR diodes go to 2 terminal boxes of the ALI 031: P5-P6).

12.3. Riferimento documentazione

12.3. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento documentazione
Interested elementary units	Drwg. No.	Documentation reference
ALI 031	14431305	Alimentatore Power supply

12.4. Tabella componenti

12.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D19	ALI 031	Diodo controllato montato sul dissipatore
		Checked diode assembled on the dissipator
D31-D37-D49	ALI 031	Diodi montati su piastra OBLO
		Diodes assembled on the OBLO board
RV7	ALI 031	Potenziometro di regolazione. Viene azionato (insieme agli altri 5 potenziometri)per ridurre il ripple ai valori nominali di 30 ÷ 50 mV
		Adjustment potentiometer. It is worked (with the other 5 potentiometer) to reduce the ripple to the nominal values of 30 ÷ 50 mV.
R30 ÷ R116		Resistenze montate sulla piastra OBLO
		Resistences assembled on the OBLO board
T2	ALI 031	Trasformatore con due secondari
		Transformer with 2 secondary windings
T9	ALI 031	Trasformatore montato sulla piastra OBLO. Fa parte del circuito dell'oscillatore bloccato.
		Transformer assembled on the OBLO board. It belongs to the blooked oscillator circuit.

12.5. Sequenza di controlli per la verifica del circuito di pilotaggio dei diodi SCR

1) Su ALI 031 piastra OBLO rilevare la presenza della f.d.o; rappresentata in figura di pag.75.

2) Procedendo per comparazione verificare che i sei oscillatori bloccati emettano la f.d.o. rappresentata in figura di pag.75.

13. ALIMENTATORE SCR
CIRCUITO DI REGOLAZIONE

13.1. Schema elettrico

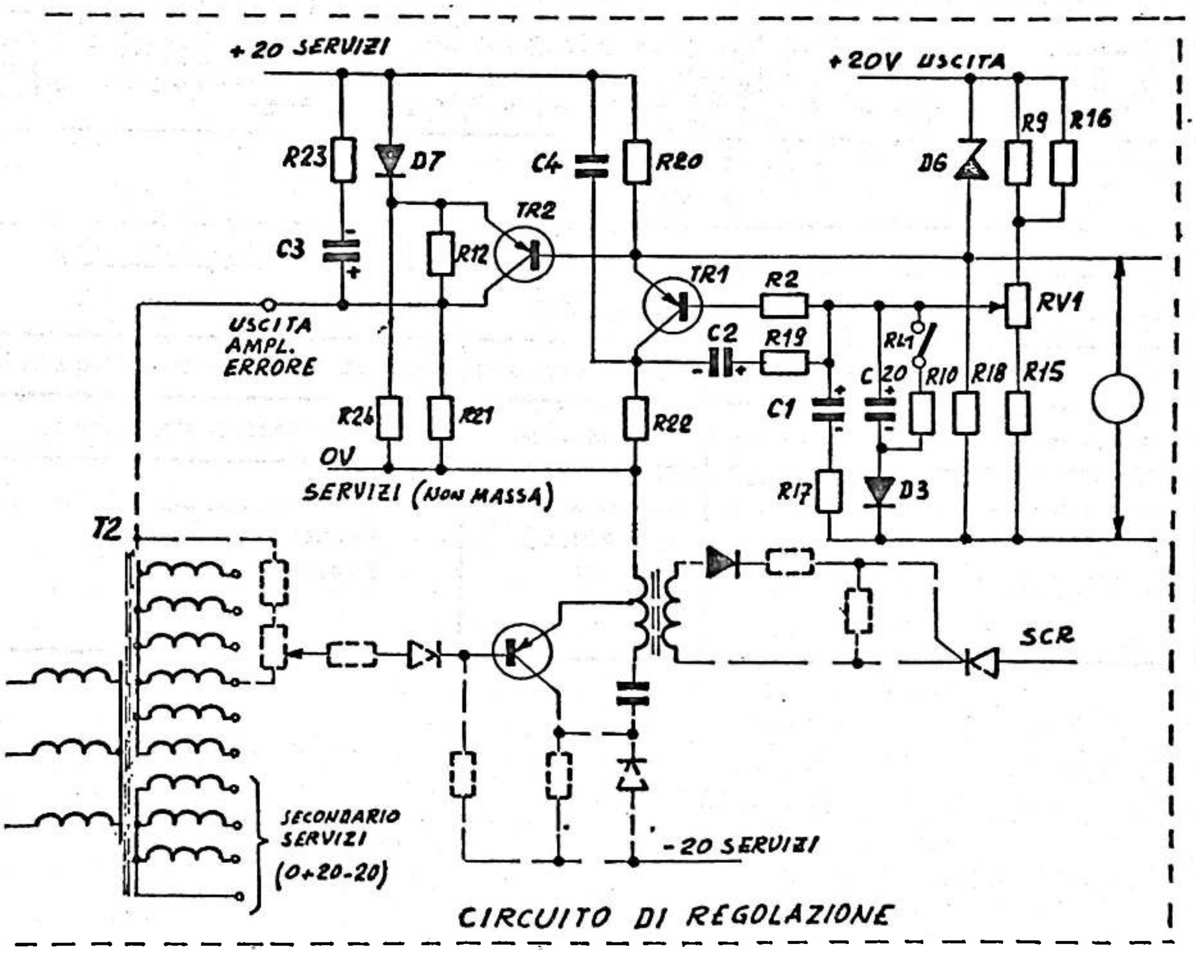
12.5. Sequence of checks

1) On the ALI 031 OBLO board, note the presence of the wave form given in figure on page 75.

2) Proceding with a comparison, check that the six blocked oscillators issue the wave form given in figure on page 75.

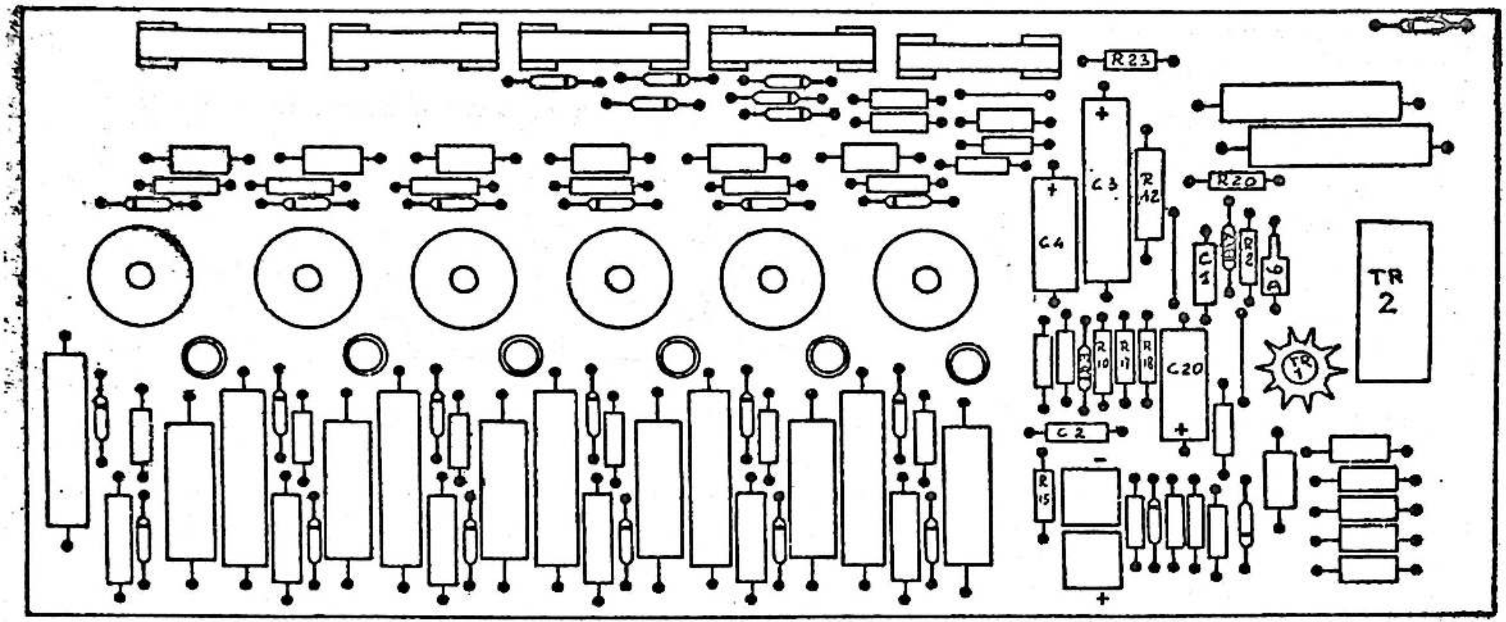
13. SCR POWER SUPPLY
ADJUSTMENT CIRCUIT

13.1. Electric diagram



13.2. Disposizione componenti sulla piastrina OBLO - 20

13.2. Arrangement of components on the OBLO board



13.3. Riferimento documentazione

13.3. Documentation reference

Unità elementari interessate Interested elementary units	N. Disegno Drwg. No.	Riferimento documentazione Documentation reference
ALI 031	14431305	Alimentatore Power supply

13.4. Tabella componenti

13.4. Components table

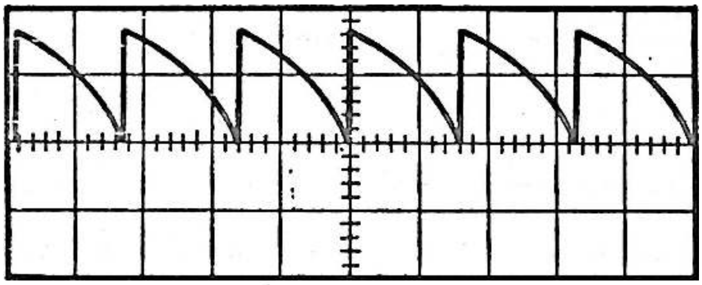
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
C1 ÷ C20	ALI 031	Condensatori sulla Piastrina OBLO - 20 Capacitors assembled on the OBLO boards
D3 ÷ D7	ALI 031	Diodi sulla Piastrina OBLO - 20 Diodes assembled on the OBLO board
RL1	ALI 031	Relé eccitato in condizioni di normale funzionamento Relay energized in conditions of normal performance
RV1	ALI 031	Potenziometro di regolazione della tensione di uscita Potentiometer to adjust the output voltage
R2 ÷ R24	ALI 031	Resistenze sulla Piastrina OBLO - 20 Resistances assembled on the OBLO board

13.5. Sequenza dei controlli sul circuito di regolazione

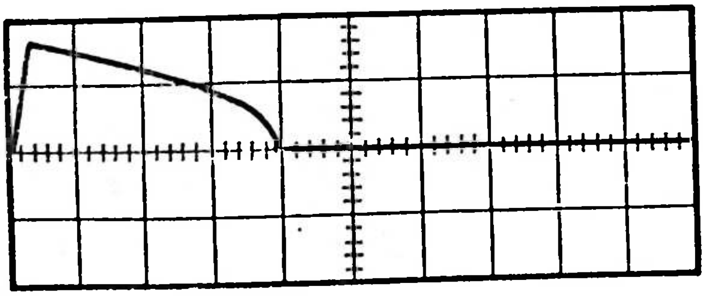
Su ALI 031 ruotare il potenziometro VU e controllare che la tensione di uscita risenta della regolazione. Se non è possibile centrare sul valore nominale di +20V la tensione di uscita, controllare i componenti del circuito amplificatore d'errore evidenziati nello schema topografico.

13.6. Alimentatore SCR
Forma d'onda rilevate in condizione di normale funzionamento

Forma d'onda rilevata al morsetto 1 della impedenza di filtro (ALI 031).



Forma d'onda di pilotaggio di un diodo SCR rilevata con l'ingresso di gate del diodo SCR scollegato.
(Morsettiere P5 - P6 su ALI 031)
(Massa dell'oscilloscopio collegata al punto 1 della induttanza L1)



13.5. Sequence of controls of the adjustment circuit

On the ALI 031 move the VU potentiometer and check that the output voltage feels the adjustment. If it is not possible to adjust the output voltage on the nominal value of +20V, check the components of the amplifier circuit of the error detected.

13.6. SCR Power Supply
Wave forms detected in normal performance conditions

Wave form detected at terminal 1 of the ALI 031 filter impedence.

Scale
2V/cm
2ms/cm

Probe atten.

Sincr. interno

Wave form of the driving of an SCR diode detected with the input of the SCR diode gate disconnected.
(Terminal boxes P5-P6 on ALI 031)
Graund terminal of the oscilloscope connected to point 1 of the filter impedence (ALI 031).

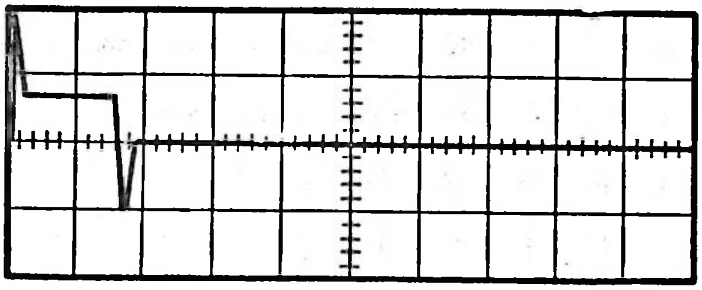
Scale
0,5V/cm
10 μs/cm

Probe atten.

Sincr. interno

Forma d'onda rilevata sul gate di un diodo SCR con il terminale di massa dell'oscilloscopio collegato al punto 1 della impedenza di filtro (ALI 031)

Wave form detected on the gate of an SCR diode with the ground terminal of the oscilloscope connected to point1 of the filter impedence (ALI 031).



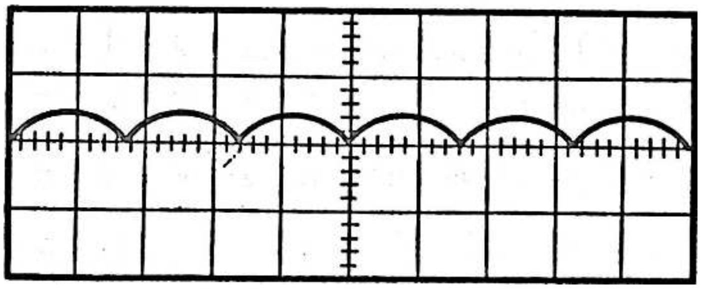
Scale
0,2V/cm
1ms/cm

Probe attenuato

Sincr. interno

Forma d'onda della ondulazione residua sulla tensione di uscita.

Waveform of the residual ripple on the output voltage



Scale
50mV/cm
2ms/cm

Probe diretto

Sincron. linea

In condizione di normale funzionamento il ripple in uscita deve presentarsi come riportato in figura. Se il ripple presenta della lievi differenze rispetto alla illustrazione riportata, si può migliorare agendo con piccoli spostamenti sui potenziometri RV2 ÷ RV7 (ALI 031).

Se la forma del ripple si discosta nettamente dalla figura riportata si tratta di una anomalia di un diodo SCR o del circuito di pilotaggio del gate del diodo stesso.

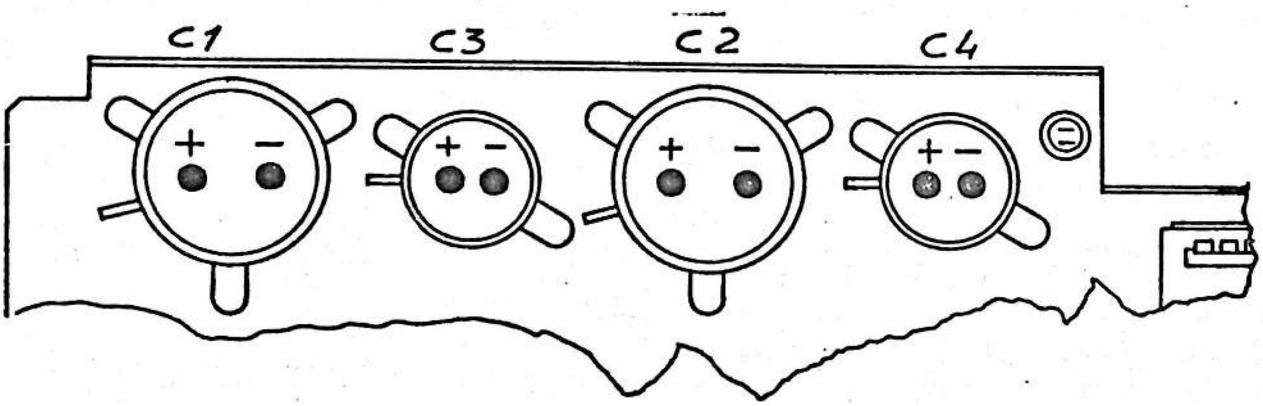
In normal performance condition the output ripple must show as given in figure. If the ripple shows some slight differences with respect to the given figure, it can be improved moving slightly potentiometers RV2 ÷ RV7 (ALI 031).
If the ripple form is definitely different from the figure given there is an anomalous SCR diode or an anomalous circuit driving the gate of the diode itself.

14. ALI 150 - VERIFICA PRESENZA TENSIONI RADDRIZZATE DI POTENZA

Le tensioni raddrizzate di potenza sono misurabili sui morsetti dei condensatori di filtro C1 ÷ C4 - Pacco trasformatori.
I valori rilevati debbono essere approssimati a quelli indicati in tabella (da rilevarsi con alimentatore su carico interno):

14. CHECK THE PRESENCE OF THE RECTIFIED POWER VOLTAGES - ALI 150

The rectified power voltages can be measured on the terminals of the filter capacitors C1 ÷ C4 - Transformers module.
The values detected must be approximated to those given on the table (to be detected with the power supply on internal loads.



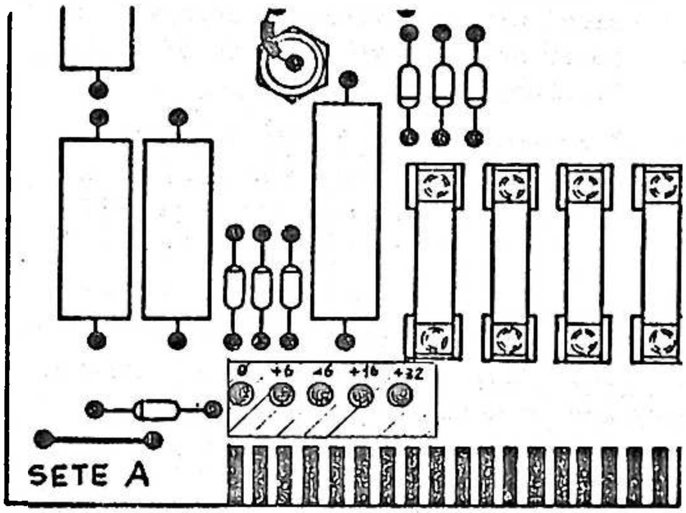
Pacco trasformatori

Transformers Module

Condens.	Tensioni ai capi	RIF. VDC.	RIF. DOCUM.
CAPACITORS	VOLTAGE	DCV. REF.	DOC. REF.
C1	18,5 V	+ 5V - AMPLIAM.	14432310 - F.1
C2	18,5 V	+ 5V - PILOTA	14432310 - f.1
C3	24,2 V	+12V	14432310 - f.2
C4	36 V	-20V	14432310 - f.3

15. ALI 150 - TENSIONI AUSILIARIE

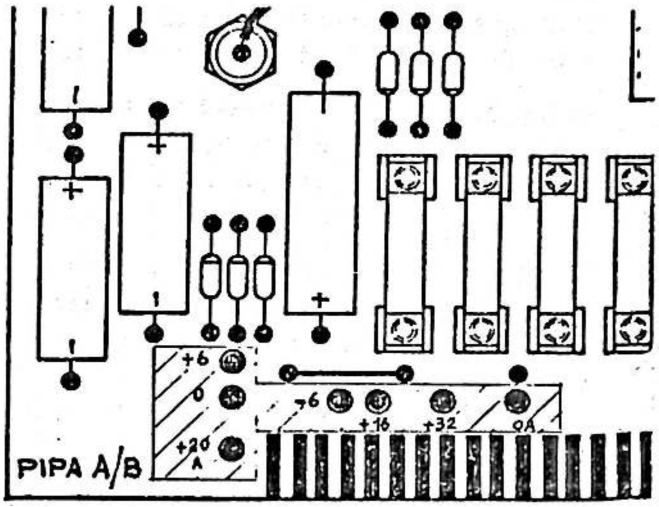
Le tensioni ausiliarie si misurano sulle piastrine PIPA-A-B e SETE-A (pacco trasformatori) come indicato.



- Il punto OA è lo zero relativo alla tensione +20A. Le tensioni +32, -16, +6, -6V hanno riferimento di zero comune nel punto 0.
- I valori di tensione debbono approssimativamente essere quelli di tabella.

15. ALI 150 - AUXILIARY VOLTAGES

Auxiliary voltages are measured on the boards PIPA-A-B and SETE-A (transformers module) as indicated.



- The point OA is the zero relative to the +20A voltage. The voltages +32, -16, +6, -6V have the common zero reference in point 0.
- The voltage values must be approximately the ones of the table.

Tensione	PIPA-A	PIPA-B	SETE	ONDULAZIONE RESIDUA - V
Voltage	PIPA-A	PIPA-B	SETE	Residual wave form
+ 6V	+ 4,2V	+ 4,8V	+ 4,8V	0,6
- 6V	- 4,7V	- 5,9V	- 5,9V	0;6
- 16V	- 16,2V	- 16,5V	- 16,5V	0,15
+ 32V	+ 34V	+ 33,5V	+ 33,5V	1,5
+ 20A	+ 19,5V	+ 20V	-	2,5

RIFERIMENTO DOCUMENTAZIONE: ALI 150
Dis. N. 14432310

DOCUMENTATION REFERENCE: ALI 150
Drwg. No. 14432310

16. ALI 150
BOX TENSIONI

I box che forniscono le tre tensioni hanno uguali circuiti. I valori differenti di tensione sono ottenuti con diversa alimentazione di potenza e differenti valori dei partitori.

Viene pertanto analizzato un box generico, essendo analogo il funzionamento per tutti; ove vi siano diversità esse vengono indicate.

La ripetitività dei circuiti è anzi di ausilio in sede di ricerca guasti, potendosi utilizzare il metodo del confronto.

16. ALI 150
VOLTAGES BOXES

The boxes, which supply the three voltage hawe equal circuits.
The different voltage values are obtained with a different supply of power and different values of the breakers.

A general box is therefore analyzed, being the performance equal for all of then, where there are some differences, they are given.

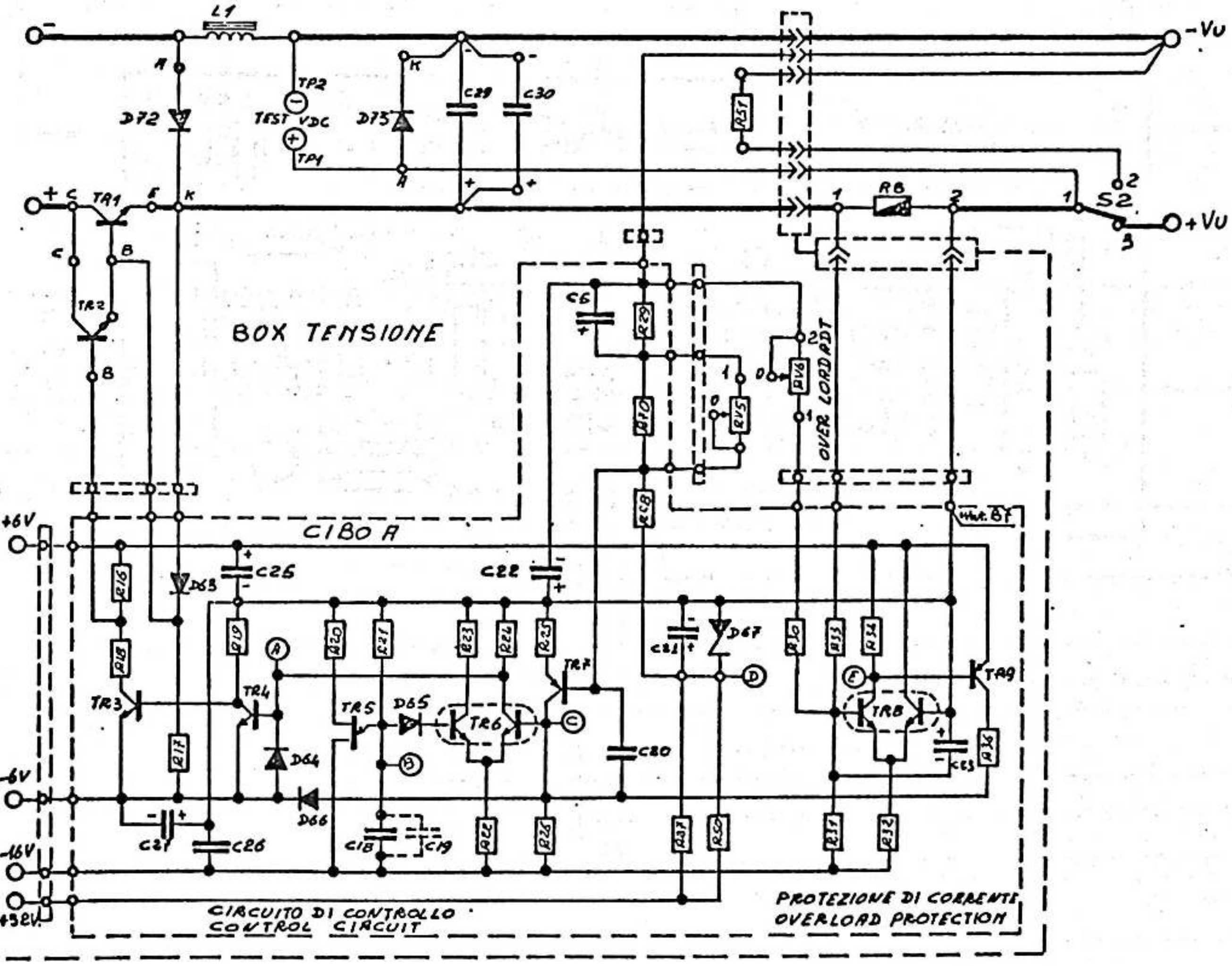
The circuits repetitiveness is to the contrary of help when looking for failures, as the comparison method may be used.

16.1. Circuito di controllo

16.1.1. Schema elettrico

16.1. Control circuit

16.1.1. Electric diagram

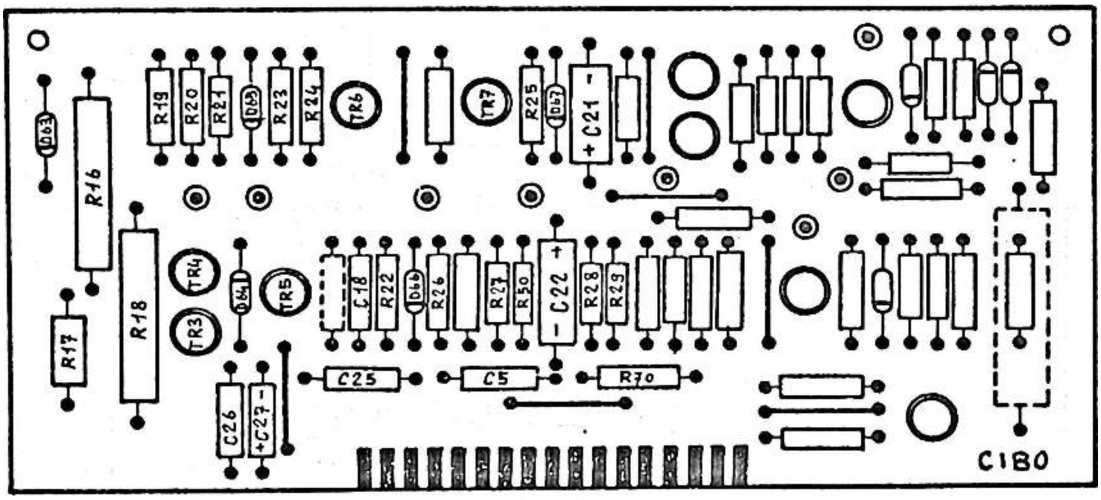


16.1.2. Disposizione topografica componenti

Componenti su piastrina CIBO

16.1.2. Components topographic arrangement

Components on the CIBO board



16.1.3. Riferimento documentaziono

16.1.3. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento documentazione
Interested elementary units	Drwg. No.	Dooumentation reference
ALI 150	14432310 f.1,2,3	Alimentatore GE-130 GE-130 Power supply

16.1.4. Tabella componenti

16.1.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetioal and numerical order	Interested elementary unit	Electric and logic funotions
C5 ÷ C26	ALI 150 P.REG.	Condensatori - Piastrina CIBO Capaoitors on the CIBO board
C29 ÷ C30	ALI 150 P.REG.	Condensatori di livellamento - Box tensione Level capacitors - Voltage box
D63 ÷ D66	ALI 150 P.REG.	Diodi protezione Vbe transistori - Piastrine CIBO Vbe transistors protection diodes - CIBO board
D67	ALI 150 P. REG.	Diodo Zener tensione di riferimento - Piastrina CIBO Voltage reference Zener diode - CIBO board

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D72	ALI 150 P. REG.	Diodo di mantenimento corrente in L1 - Box tensione
		Diode of current maintenance in L1 - Voltage boxes
R16 ÷ R29	ALI 150 P. REG.	Resistenza su piastrina CIBO
		Resistances on CIBO board
R50 ÷ R70	ALI 150 P. REG.	Resistenze su piastrina CIBO
		Resistances on CIBO board
R51	ALI 150 P. REG.	Resistenza di carico interno inserita con il sezionatore in posizione 2 - Box tensione
		Resistance of internal load inserted with switch in position 2 - Voltage box
RV5	ALI 150 P. REG.	Potenziometro di regolazione della tensione d'uscita (Voltage adj.)
		Potentiometer to adjust the output voltage (Voltage adj.)
L1	ALI 150 P. REG.	Induttanza di filtro - Box tensione
		Filter inductance: voltage box
TR1	ALI 150 P. REG.	Transistore di commutazione del regolatore serie - Box tensione
		Transistor to switch the series regulator - Voltage Box
TR2	ALI 150 P. REG.	Transistore emitter follower di pilotaggio TR1 - Box tensione
		Emitter follower transistor to drive TR1 - Voltage box

Componenti in ordine alfabetico e numerico	Unità elementari interessato	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
TR3 - TR4	ALI 150 P. REG.	Transistori amplificatori - Piastrina CIBO Amplifiers transistors - CIBO board
TR5	ALI 150 P. REG.	Transistore monogiunzione generatore dente di sega - Piastrina CIBO Unijunctions transistors generating the saw-tooth - CIBO board
TR6	ALI 150 P. REG.	Doppio transistor differenziale di regolazione - Piastrina CIBO Double transistor with differential adjustment stage - CIBO board
TR7	ALI 150 P. REG.	Transistore amplificatore del segnale di errore - Piastrina CIBO Transistor amplifying the error signal - CIBO board

16.1.5. Sequenza dei controlli sul circuito di regolazione

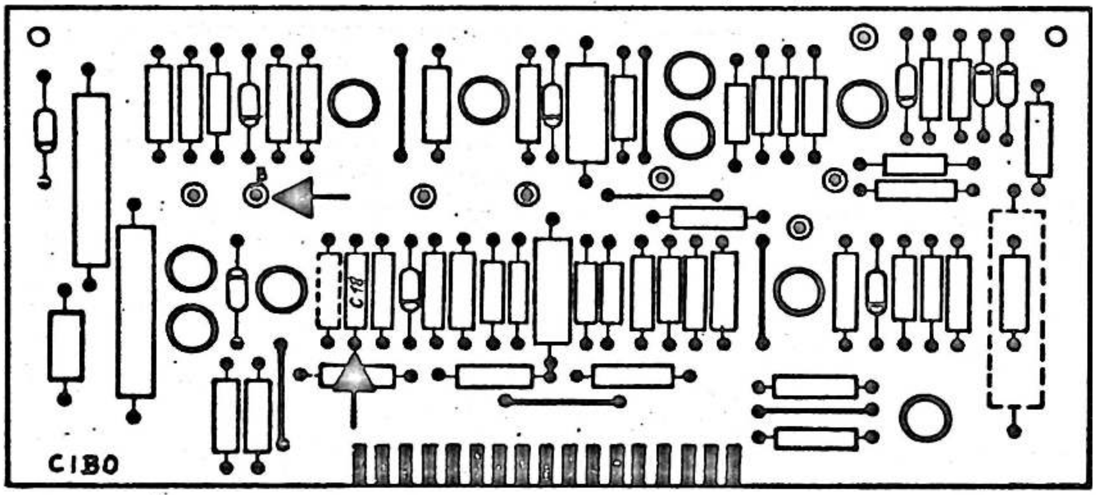
Desensibilizzare l'alimentatore ALI 150 come indicato in par. 11.7.

1) Verificare la f.d.o. sulla boccolina B con la massa dell'oscilloscopio sul condensatore C18 nel punto indicato in figura.

16.1.5. Sequence of the controls on the adjustment circuit

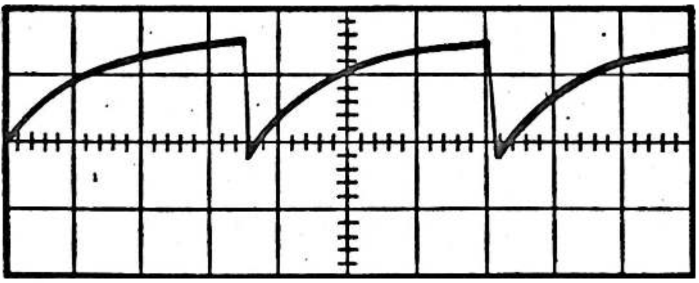
Desensitize the ALI 150 power supply as shown in par. 11.7.

1) Check the wave form on the terminal B with the ground of the oscilloscope on capacitor C18 in the point given in figure.



F.d.o. sulla boccolina B

Box +5V



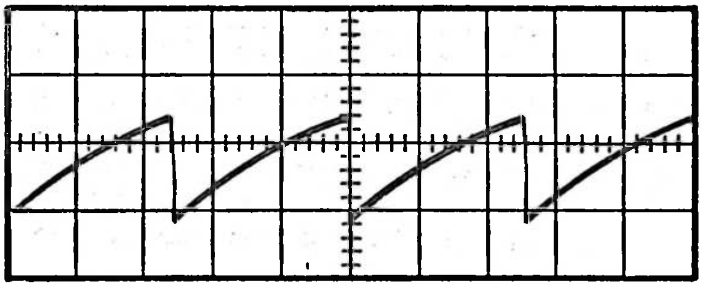
Scale

5V/cm
50 µs/cm

Probe atten.

Sincr. interno - auto

Box +12V



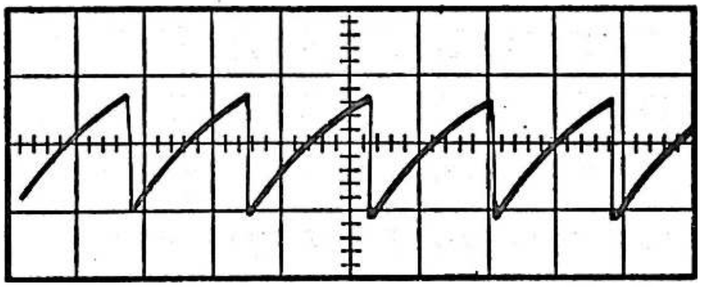
Scale

5V/cm
50 µs/cm

Probe atten.

Sincr. interno - auto

Box -20V



Scale

5V/cm
50 µs/cm

Probe atten.

Sincr. interno - auto

1) Mancando l'oscillazione verificare TR5. In caso di sostituzione di quest'ultimo è necessario verificare la frequenza. Se F ≥ a 7 KHz montare C19. Il periodo deve essere compreso tra 140 µsec e 300 µsec.

2) Verificare che tra il punto D(puntale positivo) della piastrina CIBO e la boccola "+TEST VDC"(puntale negativo), vi sia una tensione di + 5,6V ± 0,5 V
(tensione diodo Zener D67)

1) Should the oscillation be absent, check TR5. Should this one be replaced, it is necessary to check frequency. It F is ≥ at 7 KHz assemble C19. The period must range between 140 µsec and 300 µsec.

2) Check that between point D (positive test prod) of the CIBO board and the test point "+ TEST VDC" (negative test prod), there is a voltage of + 5,6V ± 0,5 V
(D67 Zener diode voltage).

3) Controllare il livello di tensione sulla boccolina C (puntale - su C18). I livelli rilevati devono approssimarsi a quelli sotto indicati. Ruotando RV5 si devono rilevare leggeri spostamenti di tale livello; a rotazione oraria ne deve corrispondere una diminuzione. Non verificandosi, misurare se vi è tensione sulla resistenza R35, in caso affermativo controllare TR9 e TR8; verificare quindi TR7 - D66 (normalmente tensione inversa) D67 - TR6 - RV5.

LIVELLI NORMALI:

BOX	+ 5V	8V ± 1V
BOX	+12V	6V ± 1V
BOX	-20V	6,2V ± 1V

4) Verificare la f.d.o. sulla boccolina A (massa su C18); il periodo deve uguagliare quello della f.d.o nel punto B.
Ruotare RV5 e verificare la variazione del rapporto pieno-vuoto.
Non verificandosi tale condizione, controllare TR6 - TR4 - D64.

3) Check the voltage level on the test point C (test prod - on C18). The levels detected must be close to the ones given below. Rotating RV5, some slight changes in this level must be noted: when rotating clockwise, there must be a decrease. Should this not occur, measure if there is power on the resistance R35; if there is, check TR9 and TR8; check then TR7 - D66 D67 - TR6 - RV5.

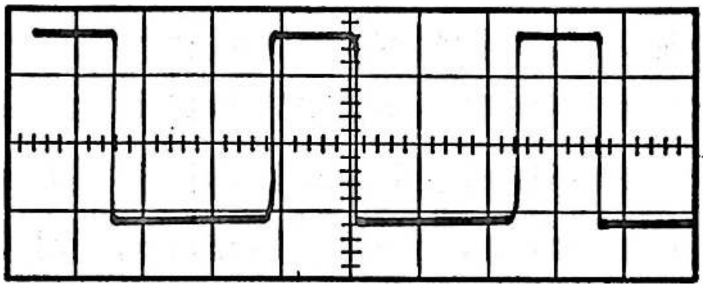
NORMAL LEVELS:

BOX	+ 5V	8V ± 1V
BOX	+12V	6V ± 1V
BOX	-20V	6,2V ± 1V

4) Check the wave form on the test point A (ground on C18), the period must be equal to the one of the wave form in point B.
Rotate RV5 and check the change in the ratio full-empty. Should this condition not occur, check TR6 - TR4 - D64.

F.d.o. sulla boccolina A **Wave form on test point A**

Box +5V



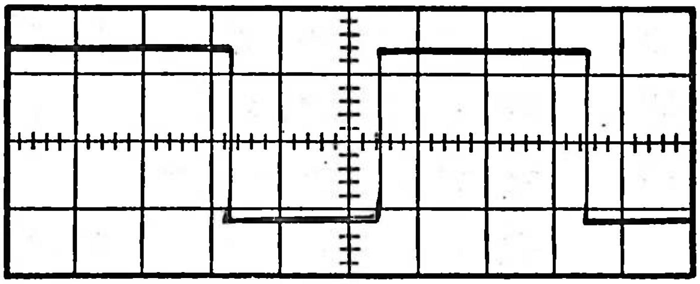
Scale

0,5V/cm
50 /us/cm

Probe attenuato

Sincr. interno

Box +12V



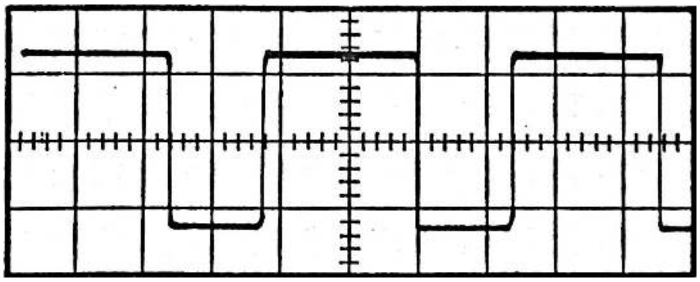
Scale

0,5V/cm
50 /us/cm

Probe attenuato

Sincr. interno

Box -20V



Scale

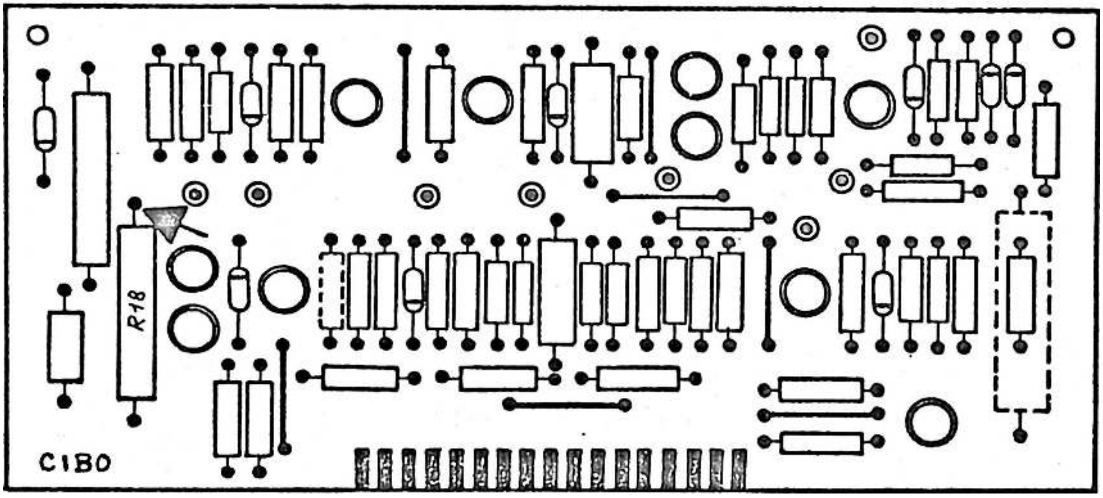
0,5V/cm
50 /us/om

Probe attenuato

Sincr. interno

5) Controllare la f.d.o. di pilotaggio del transistore emitter follower TR2, con il "Probe" sulla resistenza R18 e la massa dell'oscilloscopio sulla boccola TP1 "+ TEST VDC".

5) Check the wave form driving the TR2 emitter follower transistor , with the "Probe" on the resistance R18 and the ground of the oscilloscope on the test point TP1 "+ TEST VDC".



Verificare che abbia lo stesso andamento della f.d.o. rilevata al punto 4. Non verificandosi, controllare i transistori TR3 - TR4. Se si rileva un livello di circa 5,5V controllare i transistori TR1 - TR2.

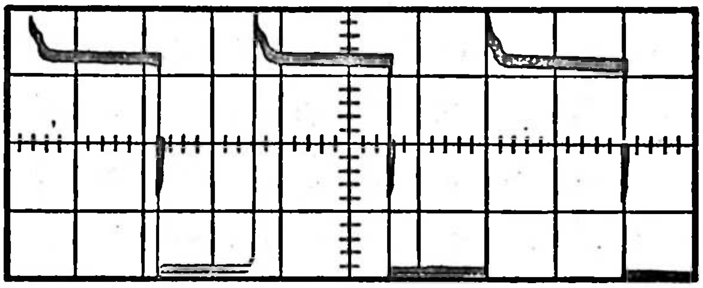
6) Controllare la f.d.o. tra collettore ed emettitore del transistore di potenza TR1, con il probe sul punto 2 del fusibile extra rapido (F23-F24-F25) e la massa sul punto 1 del riduttore amperometrico (RB-RC-RD) verificare che abbia lo stesso andamento della f.d.o. rilevata al punto 5. Non verificandosi, controllare TR1 , TR2, D63.

Check that it has the same trend of the wave form detected at point 4. Should it not occur, check the TR3 - TR4 transistors.
If a level of about 5,5V is detected, check transistors TR1 - TR2.

6) Check the wave form between colleotor and emitters of the TR1 power transistor, with the probe on point 2 of the extra fast fuse (F23-F24-F25) and the ground on point 1 of the amperometric reducer (RB-RC-RD); check that it as the same trend of the wave form detected sub point 5. Should it not occur, check TR1, TR2 and D63.

F.d.o. sui transistori TR1 **Wave forms on TR1 transistors**

Box +5V



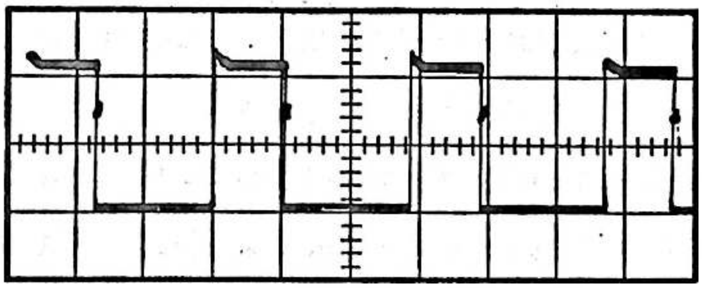
Scale

5V/cm
50 us/cm

Probe attenuato

Sincr. interno - auto

Box +12V



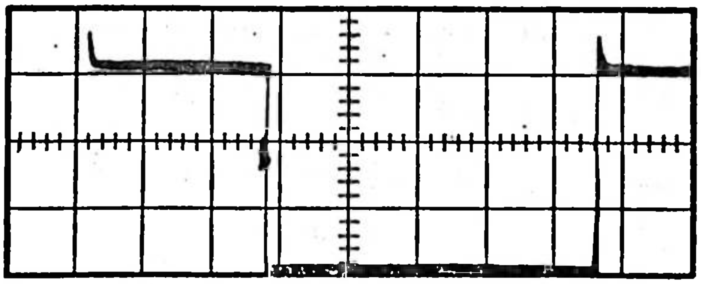
Scale

5V/cm
50 us/cm

Probe attenuato

Sincr. interno - auto

Box -20V



Scale

5V/cm
50 us/cm

Probe attenuato

Sincr. interno - auto

7) Verificare che, tramite il potenziometro RV5 "VOLTAGE ADJUST", la escursione della tensione si avvicini ai limiti riportati nella tabella. Per questa operazione è necessario escludere temporaneamente la protezione rapida e la protezione lenta di tensione, come indicato nel par.16.3.6. e 11.7.

7) Check that, through the RV5 potentiometer "VOLTAGE ADJUST" the voltage raises near the limits given in the table. For this operation, it is necessary to stop temporarily the voltage fast and slow protection as indicated in par. 16.3.6 and 11.7.

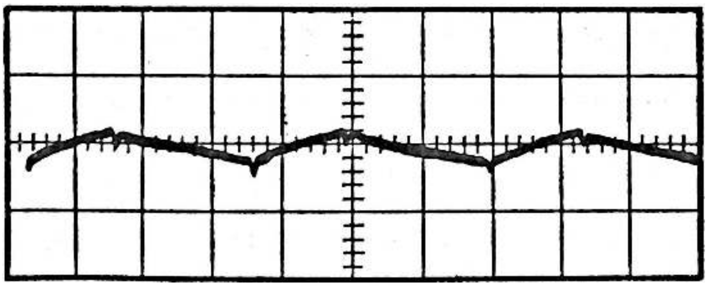
Tensione Voltage	+ 5V	min. ~ 3,9V	max. ~ 7 V
Tensione Voltage	+12V	min. ~ 10,2V	max. ~15,4V
Tensione Voltage	-20V	min. ~ 16,5V	max. ~ 28 V

8) Controllare il "ripple" (ondulazione residua) della tensione di uscita (tra TP1 e TP2); in condizioni normali deve presentarsi come in figura ed essere sempre comunque inferiore a 50 mV. Per questa misura utilizzare un probe non attenuato.

Durante questo rilievo si deve prescindere dai disturbi ad alta frequenza che appaiono sovrapposti alla ondulazione residua.

8) Check the "ripple" (residual wairing) of the output voltage (between TP1 and TP2); in normal conditions it must be as in the figure and must be anyhow below 50 mV. For this measure, use a not reduced probe.

- During this measure the high frequency noises which show overlapped to the residual waving must be left out of consideration.



Scale

50mV/cm
50 µs/cm

Probe diretto

Sincr. interno - auto

- Anche con il carico di macchina il ripple non deve superare in nessun caso i 50 mV. Se la f.d.o. del ripple si discosta nettamente da quella indicata in figura riportata, controllare il diodo D72 e i diodi del relativo ponte raddrizzatore di potenza.

16.1.6. Calibrazione della tensione di uscita

Agire sul potenziometro RV5 "VOLTAGE ADJUST" di ogni box relativo alle tre tensioni di uscita +5V, +12V, -20V. Le tensioni aumentano o diminuiscono in senso assoluto ruotando il potenziometro in senso orario od antiorario.

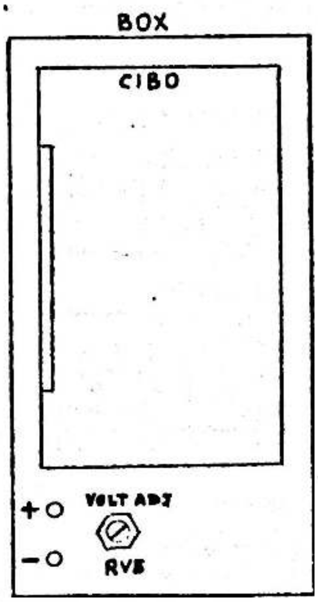
Inserire lo strumento tra le boccoline frontali TP1 (+) rossa e TP2 (-) nera.

- Also with the machine load, the ripple must not be, in any case, over 50 mV. If the wave form of the ripple is very different form the one given in figure, check the diode D72 and the diodes of the related power rectifier bridge.

16.1.6. Adjustment of the output voltage

Act on the RV5 potentiometer "VOLTAGE ADJUST" of every box related with the three output voltages +5V, +12V, -20V.
The voltages increase or decrease in the absolute sense rotating the potentiometer clockwise or counter - clockwise.

Insert the instrument between the front test points TP1 (+) red and TP2 (-) black.



Fissare le tensioni al valore nominale, inserire il carico di macchina ed eventualmente ritoccare RV5. Serrare

Supply the voltages at the nominal value, insert the machine load and eventually adjust RV5. Tighten then quindi la bussola e il dado di bloccaggio del potenziometro, facendo attenzione a non ruotare l'albero.

16.2. Protezione rapida di tensione

Comprende la protezione rapida di tensione vera e propria e la protezione mancanza fase.

Protezione rapida di tensione

16.2.1. Schema elettrico

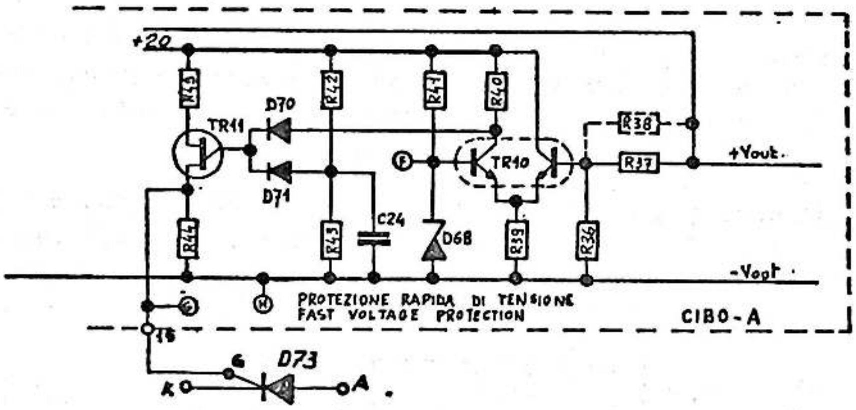
the sleeve and the nut blocking the potentiometer, being careful not to rotate the shaft.

16.2. Fast voltage protection

It includes the real fast voltage protection and the phase lack protection.

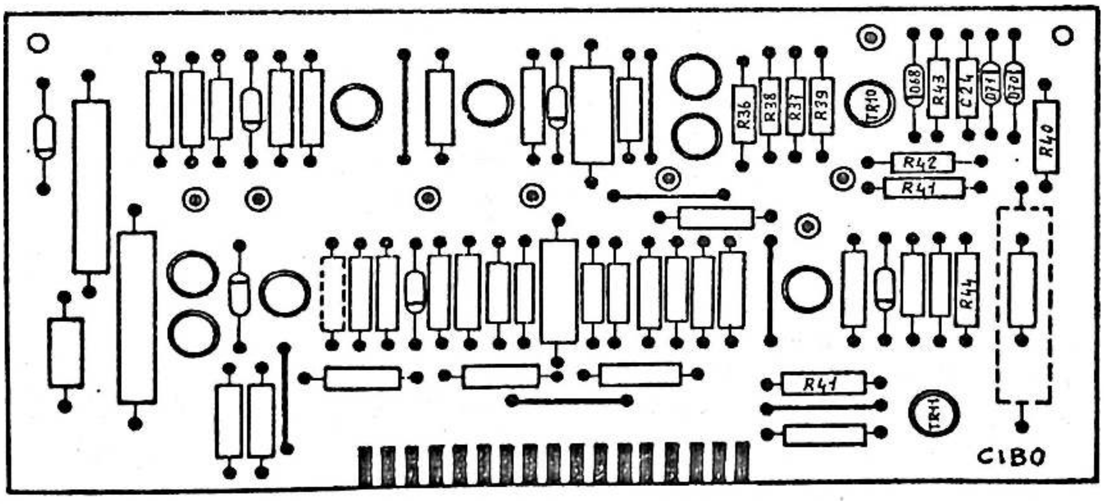
Fast voltage protection

16.2.1. Electric diagram



16.2.2. Disposizione topografica componenti - Box Tensioni - Piastrina CIBO

16.2.2. Components topographic arrangements - CIBO boards



16.2.3. Riferimento documentazione

16.2.3. Documentation reference

Parti interessate	N. Disegno	Riferimento documentazione
Interested Parts	Drwg. No.	Documentation reference
Box tensione Voltage box	14432310 -f.1 14432310 -f.2 14432310 -f.3	Alimentatore Power supply

16.2.4. Tabella componenti

16.2.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
C24	ALI 150 BOX TENS.	Condensatore per la formazione dell'impulso di accensione del diodo SCR D73 - P.CIBO Capacitors to issue the pulse to turn on the SCR diode
D68	ALI 150 BOX TENS.	Diodo Zener; tensione riferimento dello stadio differenziale - Piastrina CIBO Zener diode, reference voltage of the differencial stage - CIBO board
D70 - D71	ALI 150 BOX TENS.	Diodi separatori - Piastrina CIBO Separator diodes - CIBO board

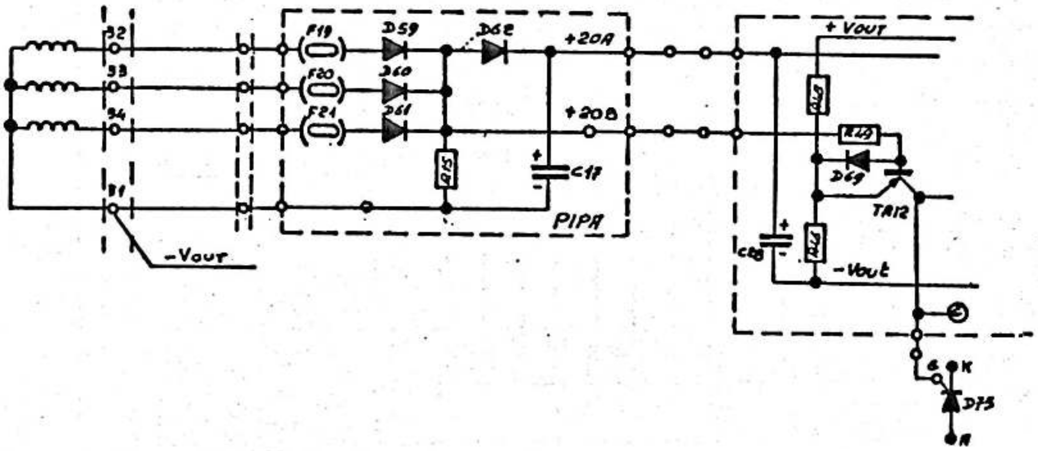
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D73	ALI 150 BOX TENS.	Diodo SCR, cortocircuita l'uscita quando interviene la protezione rapida - Sul dissipatore della resistenza R51
		The SCR diode short-circuits the output when the fast protection intervenes - On the dissipator of the R51 resistance.
R36 ÷ R38	ALI 150 BOX TENS.	Partitore calibratore del punto di intervento della protezione - Piastrina CIBO
		Breaker adjusting the protection intervention point
R39 ÷ R45	ALI 150 BOX TENS.	Resistenze - Piastrina CIBO
		Resistances - CIBO board
TR10	ALI 150 BOX TENS.	Transistore doppio che realizza uno stadio differenziale - Normalmente in conduzione il transistore di sinistra - P.CIBO
		Double transistor achieving a differential status - Normally on the transistor to the left.
TR11	ALI 150 BOX TENS.	Transistore unigiunzione. Viene innescato dal differenziale (quando commuta) e scarica C24 su R44 provocando l'accensione del diodo D73 - Piastrina CIBO
		Unijunction transistor. It is inserted by the differential (when it switches) and unloads C24 on R44 causing the switching on the D73 diode.

16.3. Protezione mancanza fase

16.3.1. Schema elettrico

16.3. Protection for phase failure

16.3.1. Electric diagram

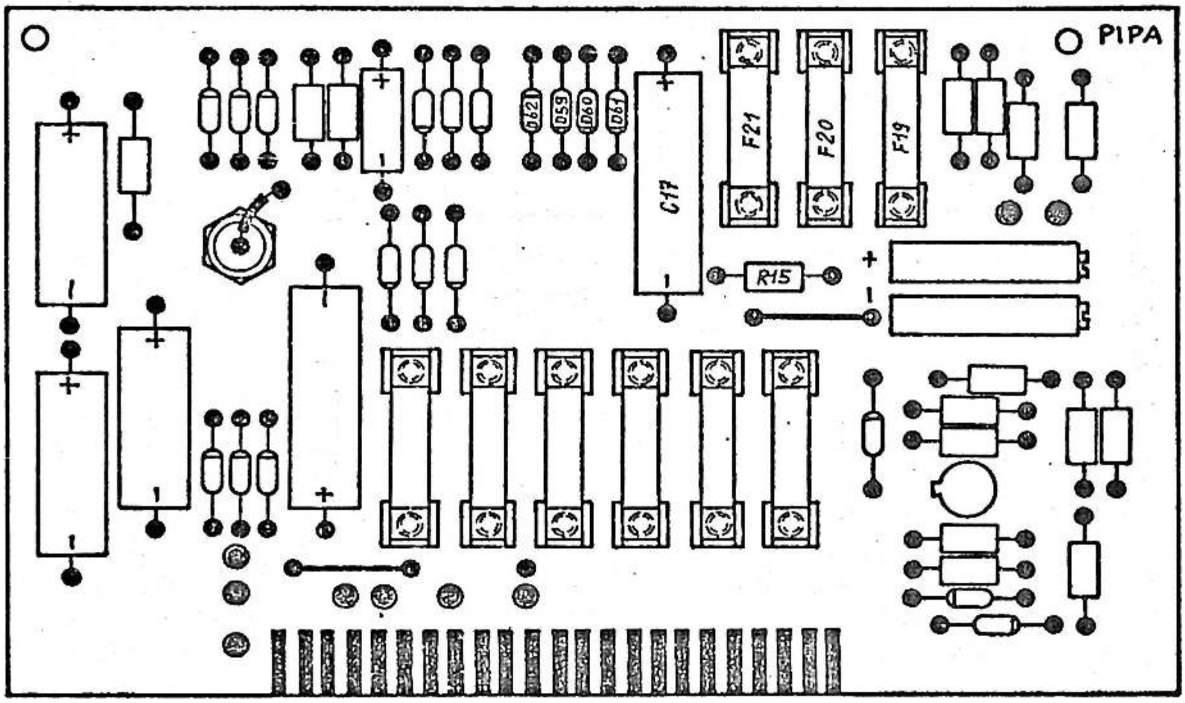


16.3.2. Disposizione topografica componenti del circuito protezione mancanza fase

16.3.2. Topographic arrangement of the components of the potection circuit for phase failure

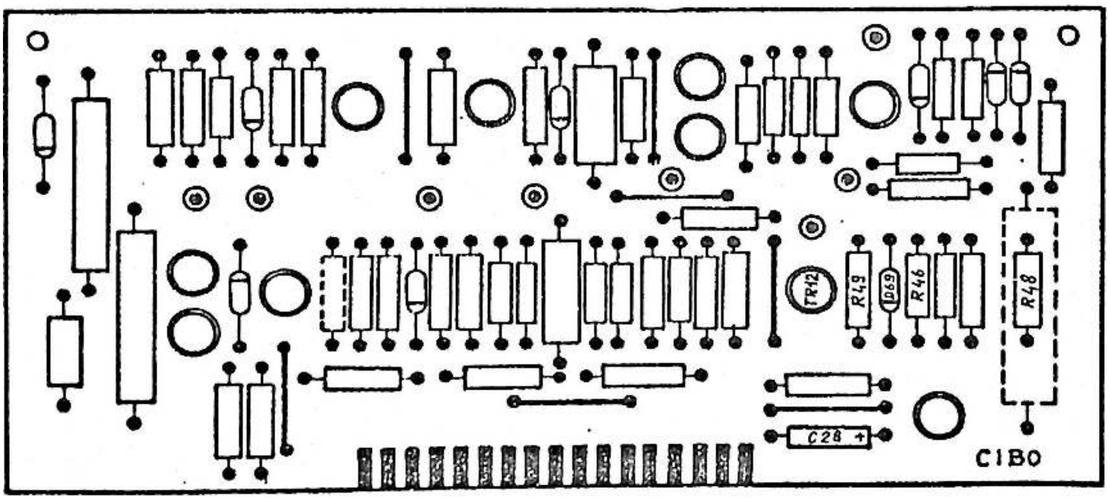
Piastrina PIPA

PIPA Board



Piastrina CIBO

CIBO Board



16.3.3. Riferimento documentazione

16.3.3. Documentation reference

Unità interessata	N. Disegno	Riferimento Documentazione
	Drwg. No.	Documentation reference
ALI 150	14432310 f.1-2-3	Alimentatore Power supply

16.3.4. Tabella componenti

16.3.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
C17	ALI 150 PACCO TRASF.	Condensatore di livellamento della tensione +20A - Piastrina PIPA
		Capacitor to level the voltage +20A on the PIPA board
C28	ALI 150 BOX TENS.	Condensatore di livellamento +20A - Piastrina CIBO
		Capacitor to level +20A - CIBO Board
D59 ÷ D61	ALI 150 PACCO TRASF.	Diodi raddrizzatori - Piastrina PIPA
		Rectifier diodes - PIPA board
D62	ALI 150 PACCO TRASF.	Diodo separatore - Piastrina PIPA
		Separator diode - PIPA board

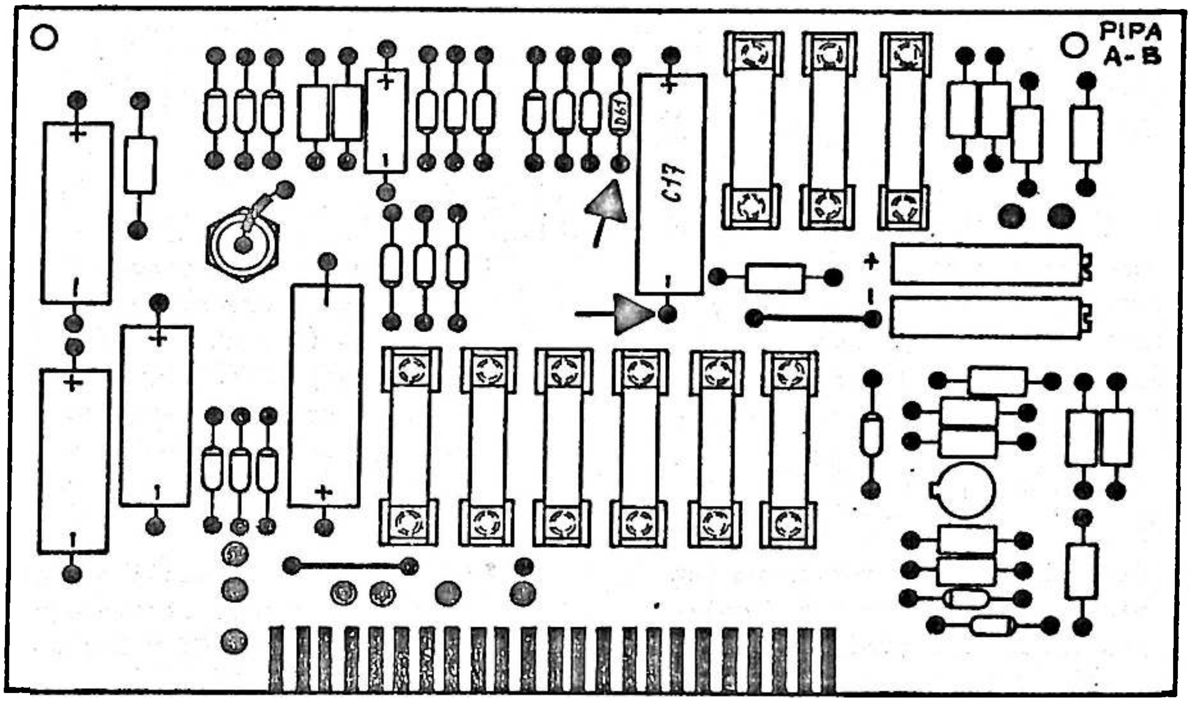
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
D69	ALI 150 BOX TENS.	Diodo limitazione VBE inversa - Piastrina CIBO
		Diode to limit reverse VBE - CIBO board
D73	ALI 150 BOX TENS.	Diodo SCR per il cortocircuito dell'uscita - Box tensione
		SCR diode for the short-circuit at the output of the voltage box
R15	ALI 150 P.TRASF.	Resistenza - Piastrina PIPA
		PIPA board resistance
R46 ÷ R49	ALI 150 BOX TENS.	Resistenze - Piastrina CIBO
		CIBO board resistance
TR12	ALI 150 BOX TENS.	Transistore di comando SCR - Piastrina CIBO
		SCR command transistors - CIBO board

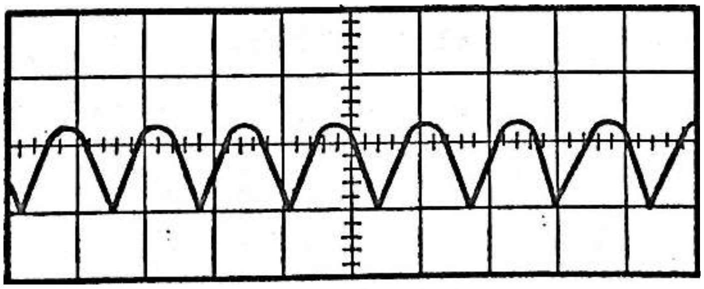
16.3.5. Sequenza di operazioni per il controllo del circuito di protezione rapida di tensione

1) Verificare la f.d.o. tra il catodo del diodo D61 (PROBE) e il condensatore C17 (MASSA) come indicato:

16.3.5. Operation sequence to check the fast voltage protection circuit

1) Check the wave form between cathod of the D61 diode (PROBE and the C17 capacitor (GROUND) shown:





Scala

10V/cm
5ms/cm

Probe : attenuato

Sincr. Linea - auto

2) Verificare che tra il punto F della piastrina CIBO e la boccolina " – TEST VDC" vi sia una tensione di 5,6 V ± 2% (tensione del diodo Zener D68).

3) Agire su RV5 "VOLTAGE ADJ." e variare lentamente la tensione di uscita; verificare che si abbia l'intervento della protezione di tensione rapida entro i limiti indicati:

Tensione

+ 5V – 5,5 V ÷ 5,95V
+ 12V – 12,98V ÷ 14V
– 20V – 21,8 V ÷ 24V

In caso di errato intervento (o intervento persistente) della protezione (tensione in uscita ~ 1V) è necessario discriminare se esso è provocato dalla protezione mancanza fase, dalla protezione rapida di tensione, o dal diodo SCR – D73.

a) Disabilitare la protezione ponticellando i punti G e H sulla piastrina CIBO (ved.par 16.3.6) Persistendo in uscita una tensione di circa 1V, controllare il diodo D73 come indicato al punto 4).

b) Riabilitare la protezione eliminando il ponticello tra G e H, collegare il catodo del diodo D71 con il punto H sulla piastrina CIBO. Persistendo l'intervento, verificare i componenti della protezione mancanza fase. In caso contrario verificare TR10 – TR11.

2) Check that between the point F of the CIBO board and the test point " – TEST VDC" there is a voltage of 5,6V ± 2% (voltage of the D68 Zener diode).

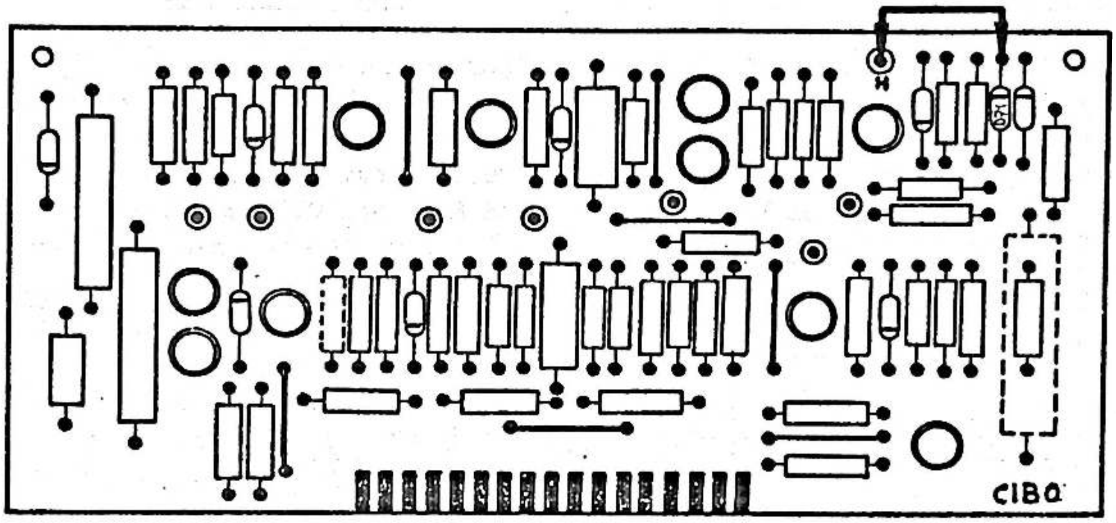
3) Act on RV5 "VOLTAGE ADJ." and vary slowly the output voltage; check that there is the fast voltage protection within the given limits:

Voltage

In case of wrong intervention (or persisting intervention) of the protection (output voltage~1V) it is necessary to check whetjer it is caused by the protection for phase failure, by the fast voltage protection, or by the SCR – D73 diode.

a) Disable the protection introducing strappings between points G and H on the CIBO board (refer to para. 16.3.6).
Should the voltage in output stay at about 1V, check the D73 diode as shown on point 4).

b) Enable again the protection removing the strappings between G and H, connect the cathode of the D71 diode with the point H on the CIBO board.
Should the intervention persist, check the components of the protection for phase failure. To the contrary, check TR10 – TR11.

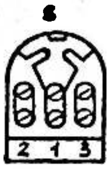


4) Controllo del diodo SCR D73:

a) Portare il sezionatore della tensione interessata in posizione di aperto, come indicato in figura. Alimentatore spento.

4) Control of the SCR D73 diode

a) Bring the breaker in position of open, as shown in the figure. Power supply off.



b) Rilevare la resistenza, tramite ohmmetro, tra le boccole Tp1 "+ TEST VDC" (puntale positivo dell'ohmmetro) e Tp2 " - TEST VDC" (puntale negativo).
Si deve rilevare una resistenza di almeno 60 ohm per la tensione + 5V e di almeno 200 ohm per le tensioni + 12V e -20 V.

b) Measure the resistance, through the ohmmeter, between test points TP1 "+ TEST VDC" (positive test prod of the ohmmeter) and TP2 "- TEST VDC" (negative test prod).
A resistance of about 60 ohm be measured for the +5V and at least of 200 ohm for voltages +12V and -20V, boxes.

16.3.6. Esclusione della protezione rapida di tensione

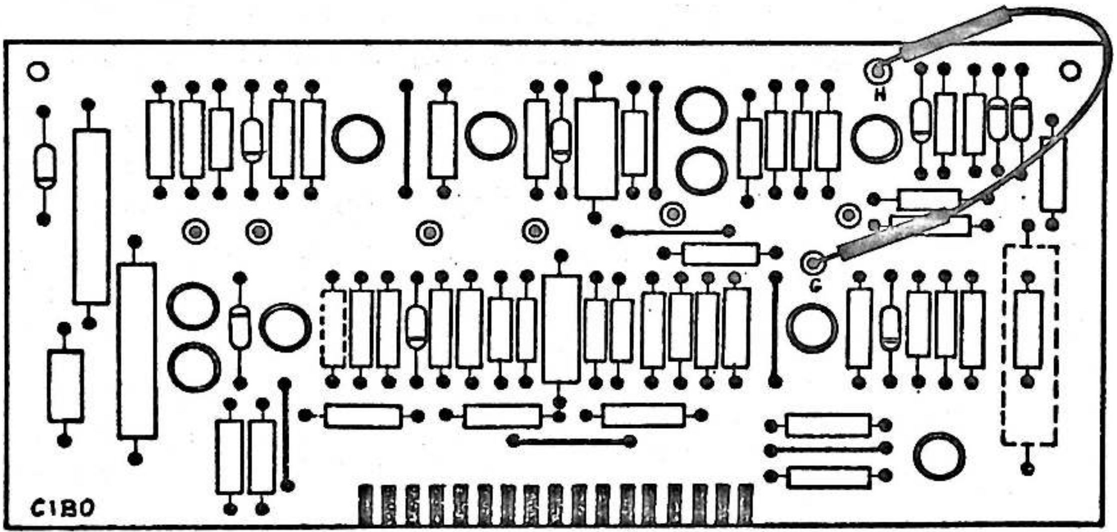
Operazione da effettuarsi solo temporaneamente per la verifica del funzionamento del circuito di controllo.
Cortocircuitare i punti di misura G e H sulla piastrina CIBO del box relativo alla tensione in esame.

QUESTA OPERAZIONE NON DEVE MAI ESSERE ESEGUITA QUANDO L'ALIMENTATORE E' COLLEGATO ALLA MACCHINA

16.3.6. Exclusion of the voltage fast protection

Operation to be performed only temporarily to check the performance of the control circuit.
Short-circuit the measure points G and H on the CIBO board of the box related to the voltage under exam.

THIS OPERATION MUST NEVER BE PERFORMED WHEN THE POWER SUPPLY IS CONNECTED TO THE MACHINE



Utilizzare l'apposito puntale a cod. 0837137 Y

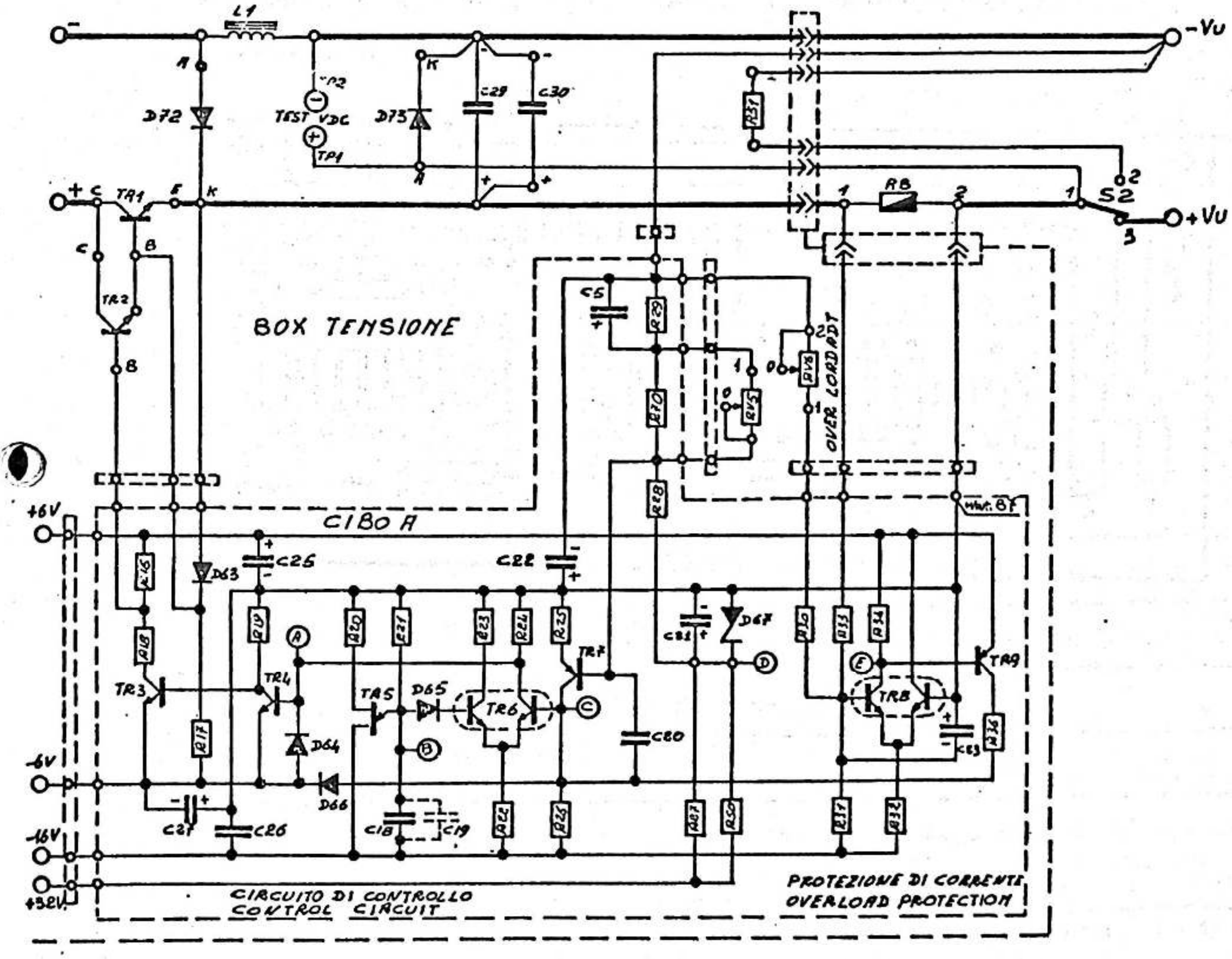
Use the special test point with cod. 0837137 Y

16.4. Circuito protezione di corrente

16.4.1. Schema elettrico

16.4. Circuit of current protection

16.4.1. Schema elettrico

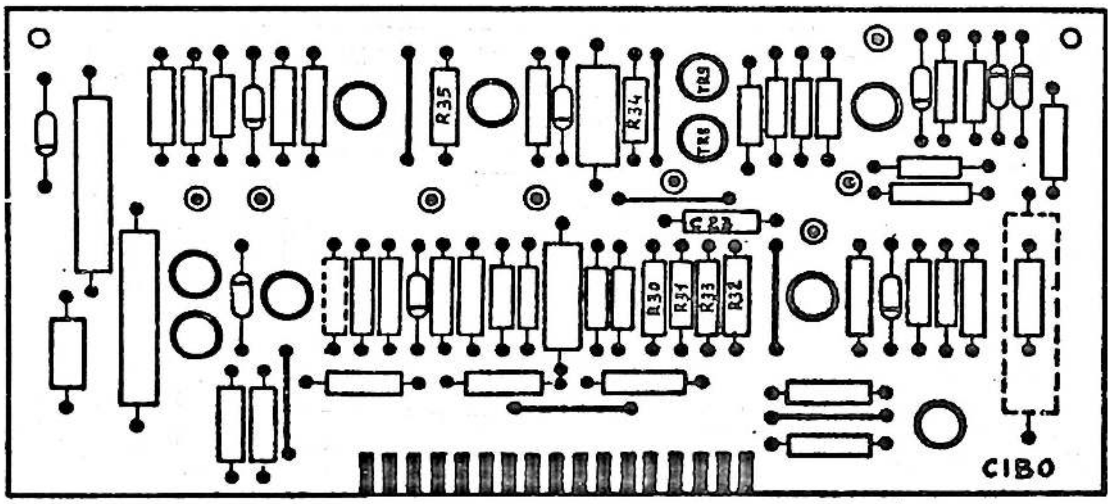


16.4.2. Disposizione topografica componenti

Componenti su piastrina CIBO

16.4.2. Components topographic arrangement

Components on CIBO board



16.4.3. Riferimento Documentazione

16.4.3. Documentation reference

Parti interessate	N. Disegno	Riferimento documentazione
INTERESTED PARTS	Drwg. No.	Documentation reference
ALI 150 PACCO REGOLAZIONE ALI 150 ADJUSTMENT MODULE	14432310 f.1-2-3	Alimentatore Power supply

16.4.4. Tabella componenti

16.4.4. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
C23	ALI 150 BOX TENS.	Condensatore elettrolitico - Piastr. CIBO
		Elecholytic capacitor - CIBO board
R30 ÷ R35	ALI 150 BOX TENS.	Resistenze - Piastrina CIBO
		Resistances - CIBO board
RV6	ALI 150 BOX TENS.	Potenziometro di regolazione della soglia di intervento della protezione di corrente
		Potentiometer to adjust the current protection intervention threshold
RA ÷ RD	ALI 150 BOX TENS.	Shunt di misura amperometro utilizzati come resistenza spia della corrente erogata. Pannello posteriore.
		Shunt of amperometric measure, used as resistance indicator of the issued current.

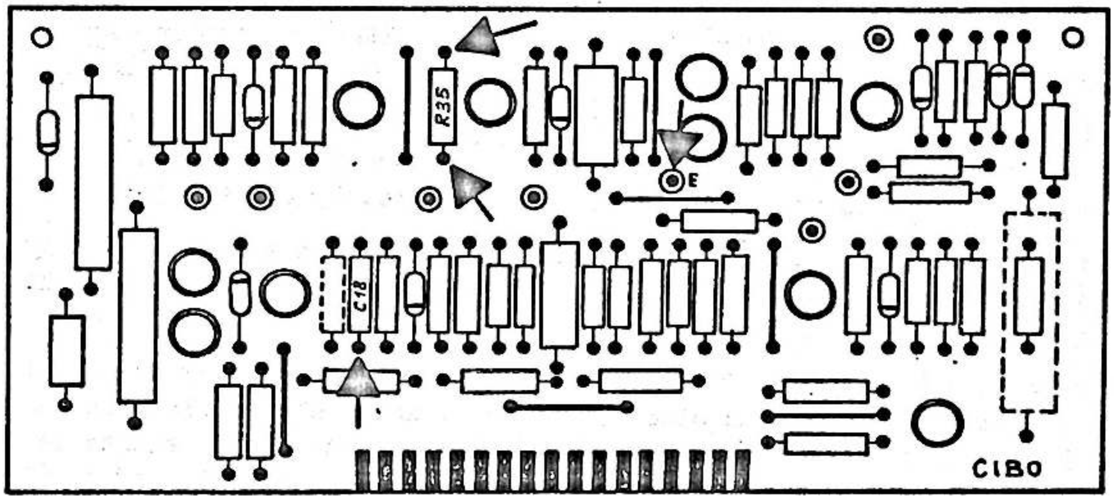
Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
TR8	ALI 150 BOX TENS.	Doppio transistore utilizzato come stadio differenziale - Normalmente in conduzione il transistore di destra - Piastrina CIBO
		Double transistor used as differential stage - Normally on the transistor to the right - CIBO board
TR9	ALI 150 BOX TENS.	Transistore amplificatore, normalmente aperto. Si chiude quando la corrente erogata supera il limite prefissato, bloccando così il circuito di controllo con conseguente apertura di TR1
		Transistor amplifier, normally open. It closes when the issued current is above the pre-fixed limit, thus blocking the control circuit with subsequent opening of TR1.

16.4.5. Sequenza dei controlli sul circuito protezione di corrente

1) Controllare la tensione sulla boccolina E (puntale positivo) della piastrina CIBO (puntale negativo su C18). In condizioni normali si deve rilevare una tensione di 21V ± 1V.

16.4.5. Sequence of controls on the current protection circuits

1) Check the voltage on test point E (positive test probe) of the CIBO board (negative test probe on C18). In normal conditions a current of 21V ± 1V must be measured.



2) Controllare la caduta di tensione sulla resistenza R35. In condizioni normali non si deve rilevare tensione, in caso contrario controllare TR8 - TR9.

Al termine dell'intervento effettuare la taratura come specificato in 16.4.6.

2) Check the voltage failure on resistance R35. In normal conditions no voltage must be detected, in the opposite case check TR8 - TR9.

At the end of the intervention adjust as specified in par. 16.4.6.

16.4.6. Calibrazione della protezione di corrente

1) Mettere fuori tensione l'Alimentatore

2) Porre l'Alimentatore su carico interno portando i sezionatori delle tensioni in uscita in posizione a "LOAD".

3) Ruotare la vite del derivatore "Shunt" della tensione in oggetto verso "C.CAL" sino a fine corsa.

4) Ruotare il potenziometro "OVERLOAD" della tensione in oggetto completamente in senso antiorario.

5) Mettere sotto tensione l'Alimentatore e regolare la tensione al valore nominale.

6) Ruotare il potenziometro "OVERLOAD" lentamente in senso orario sino a che la tensione di uscita tende a diminuire di 102 decimi di Volt.

7) Mettere fuori tensione l'alimentatore e portare la vite del derivatore su "NORM" serrandola bene a fondo.

16.4.6. Current protection calibration

1) Power off the Power Supply

2) Set the power supply on internal load bringing the output voltage breakers in the position apposite to "LOAD"

3) Rotate the Shunt screw of the voltage in object touwards "C.CAL" up to the end of the run.

4) Rotate the "OVERLOAD" potentiometer of the voltage in doject completely counterclockwise.

5) Power on the power supply and adjust the voltage to the nominal value.

6) Rotate the "OVERLOAD" potentiometer slowly clockwise until the output voltage starts to decrease of ~~102~~ tenths of a volt.
1 oder 2 zehntel von einem Volt

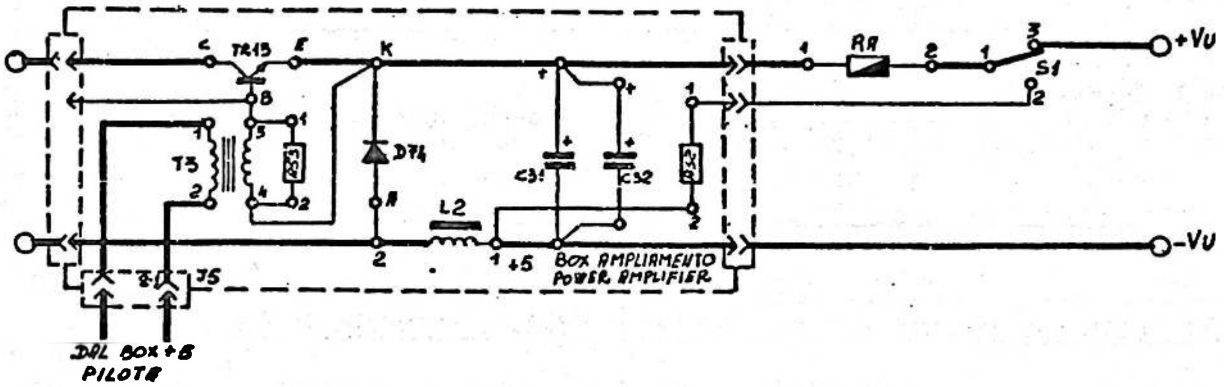
7) Power off the power supply and bring the shunt screw on "NORM" tightening it well.

17. BOX TENSIONE +5V AMPLIAMENTO

17.1. Schema elettrico

17. ENLARGEMENT OF VOLTAGE BOX +5V

17.1. Electric diagram



17.2. Riferimenti documentazione

17.2. Documentation reference

Parti interessate	N. Disegno	Riferimento documentazione
Interested parts	Drwg. No.	Documentation reference
ALI 150 pacco regolazione	14432310 f.1	Alimentatore Power supply

17.3. Tabella componenti

17.3. Components table

Componenti in ordine alfabetico e numerico	Parti interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested Parts	Electric and logic functions
C31 - C32	ALI 150 BOX AMPL.	Condensatori di livellamento VU - Box Ampliamento Capacitors of VU levelling - Enlargement box
D74	ALI 150 BOX AMPL.	Diodo di mantenimento corrente in L2 Diode to maintain the current in L2.
L2	ALI 150 BOX AMPL.	Induttanza del filtro di livellamento Induttance of the level filter
RA	ALI 150 BOX AMPL.	Shunt di misura amperometrica - Fannello pacco regolazione Shunt of amperometric measure - Panel of the adjustment module

Componenti in ordine alfabetico e numerico	Parti interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested Parts	Electric and logic functions
R52	ALI 150 BOX AMPL.	Resistenza per il carico interno Resistance for the internal loading
R53	ALI 150 BOX AMPL.	Resistenza di adattamento impedenza del trasformatore T3 Resistance to adjust the impedence of the T3 transformer
T3	ALI 150 BOX AMPL.	Trasformatore di corrente per il pilotaggio di TR13 Voltage transformer to drive TR13
TR13	ALI 150 BOX AMPL.	Transistore di regolazione Adjustment transistor

17.4. Sequenza dei controlli sul box ampliamento +5V

1) Verifica della f.d.o. tra collettore ed emitter di TR13, probe dell'oscilloscopio sul punto 2 di F22 e massa oscillografo sul punto 1 di RA.
   Deve ripetere la f.d.o. collettore-emitter del transistore TR1 del box +5 V pilota (vedi 16.1.5. punto 6)

2) Controllare il diodo D74 tramite misura ohmmetrica tra i piedini 4-1 e 4-2 del connettore del box (J5).

17.4. Sequence of controls on the +5V enlargement box

1) Check the wave form between collector and emitter of TR13, oscilloscope probe on point 2 of F22 and oscilloscope ground on point 1 of RA.
   It must repeat the wave form collector-emitter of the TR1 transistor of +5V drive box (see par. 16.1.5. at 6)

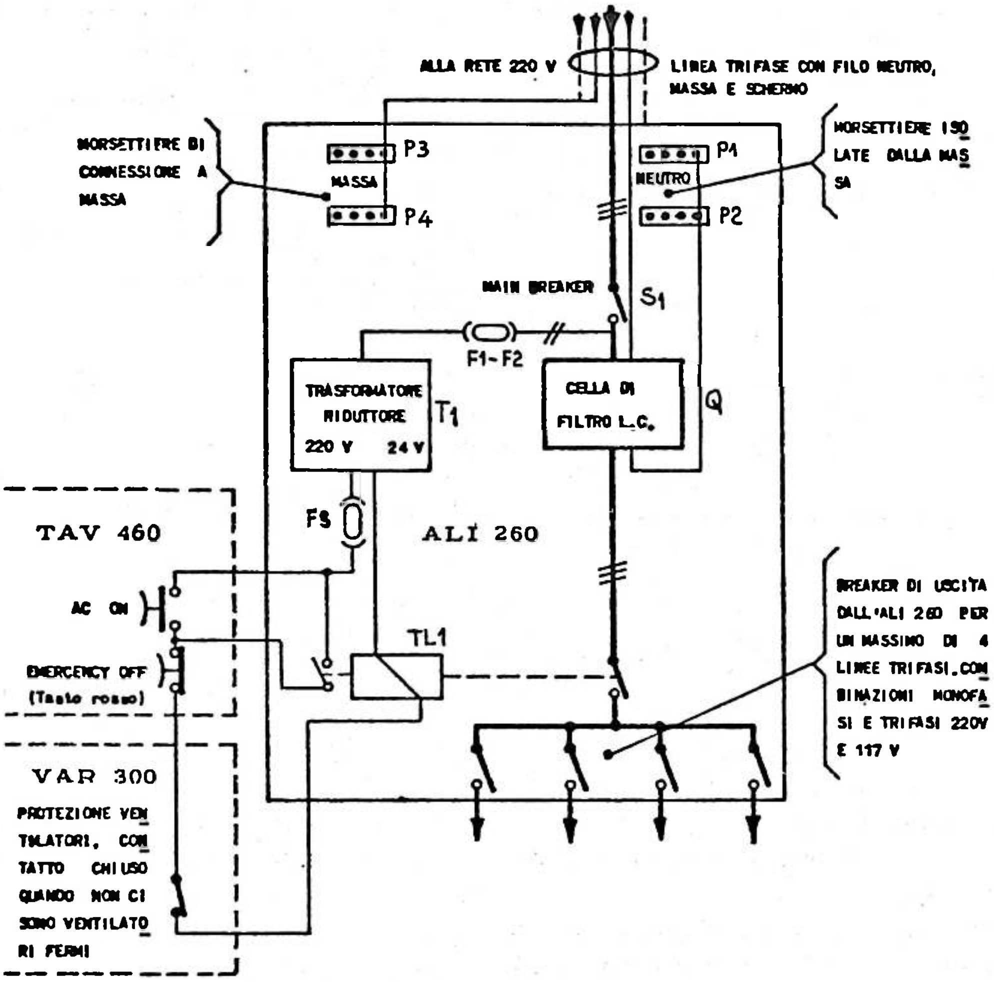
2) Check the diode D74 through the ohmetric measure between pins 4-1 and 4-2 of the box connector (J5).

18. CIRCUITI DI ALIMENTAZIONE IN ALTERNATA

Schema unifilare LINEA - ALI 260

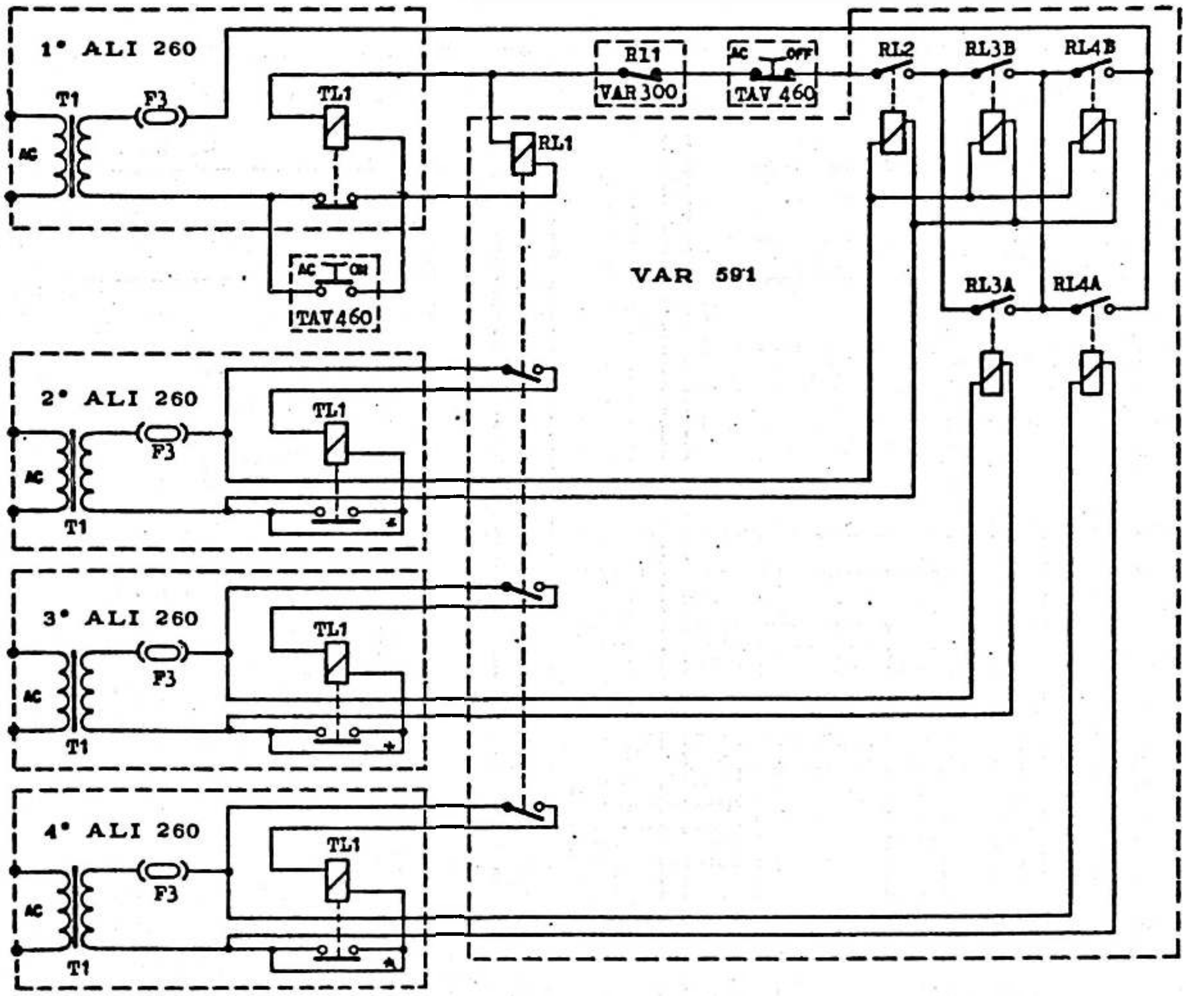
18. A.C. POWER SUPPLY CIRCUITS

ALI 260 - LINE simplified diagram.


ALLA RETE 220 V
LINEA TRIFASE CON FILO NEUTRO, MASSA E SCHERMO
MORSETTIERE DI CONNESSIONE A MASSA
P3
MASSA
P4
P1
NEUTRO
P2
MORSETTIERE ISOLATE DALLA MASSA
MAIN BREAKER
S1
F1-F2
TRASFORMATORE RIDUTTORE
220 V
24 V
T1
CELLA DI FILTRO L.C.
Q
FS
ALI 260
TAV 460
AC ON
EMERGENCY OFF
(Tasto rosso)
TL1
BREAKER DI USCITA DALL'ALI 260 PER UN MASSIMO DI 4 LINEE TRIFASI, COMBINAZIONI MONOFASI E TRIFASI 220V E 117 V
VAR 300
PROTEZIONE VENTILATORI, CONTATTO CHIUSO QUANDO NON CI SONO VENTILATORI FERMI

18.1. Intercollegamento comandi ALI 260

18.1. Interconnection of ALI 260 controls

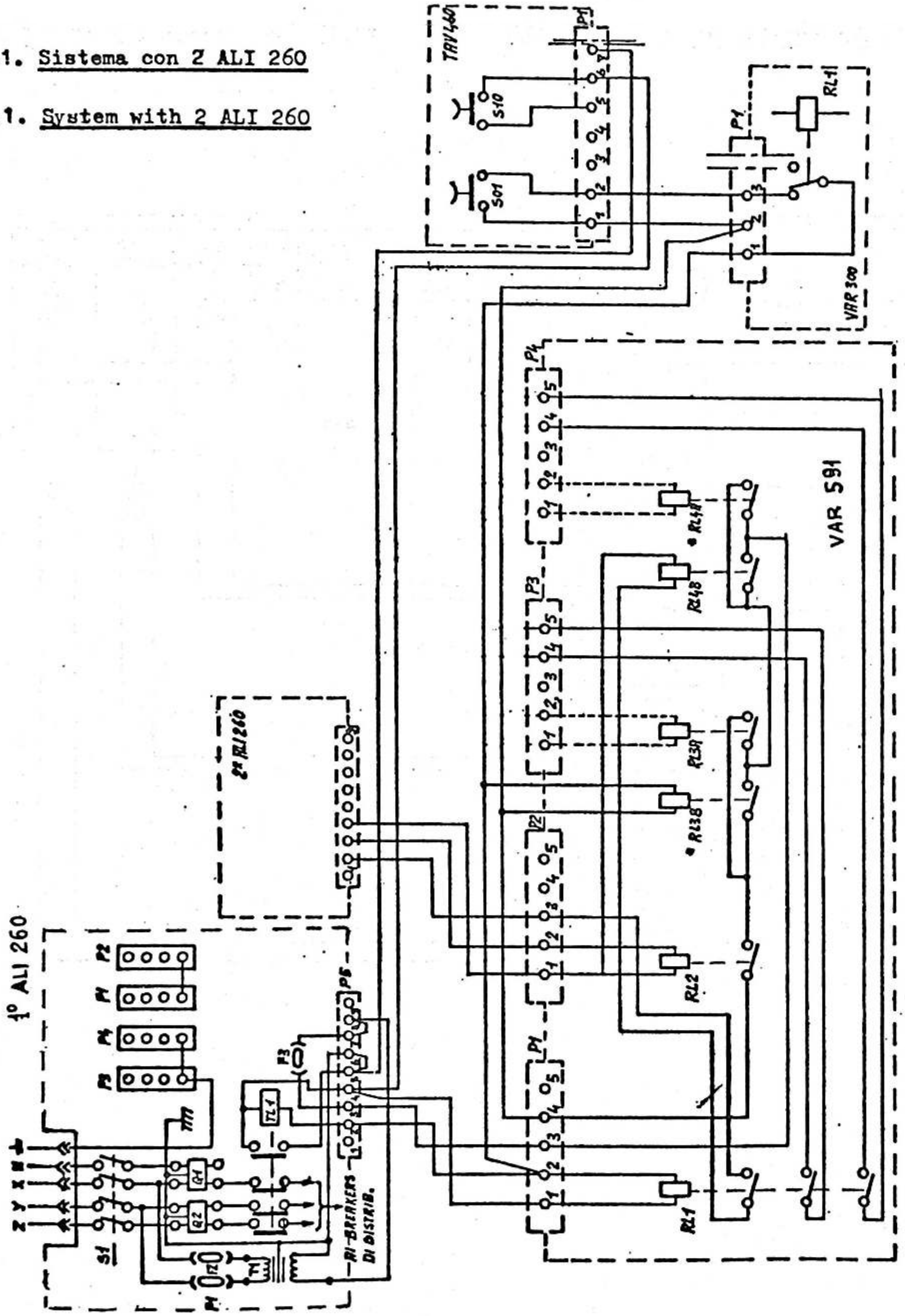


* Ponticelli realizzati su morsettiera.

* Strappings on terminal box.

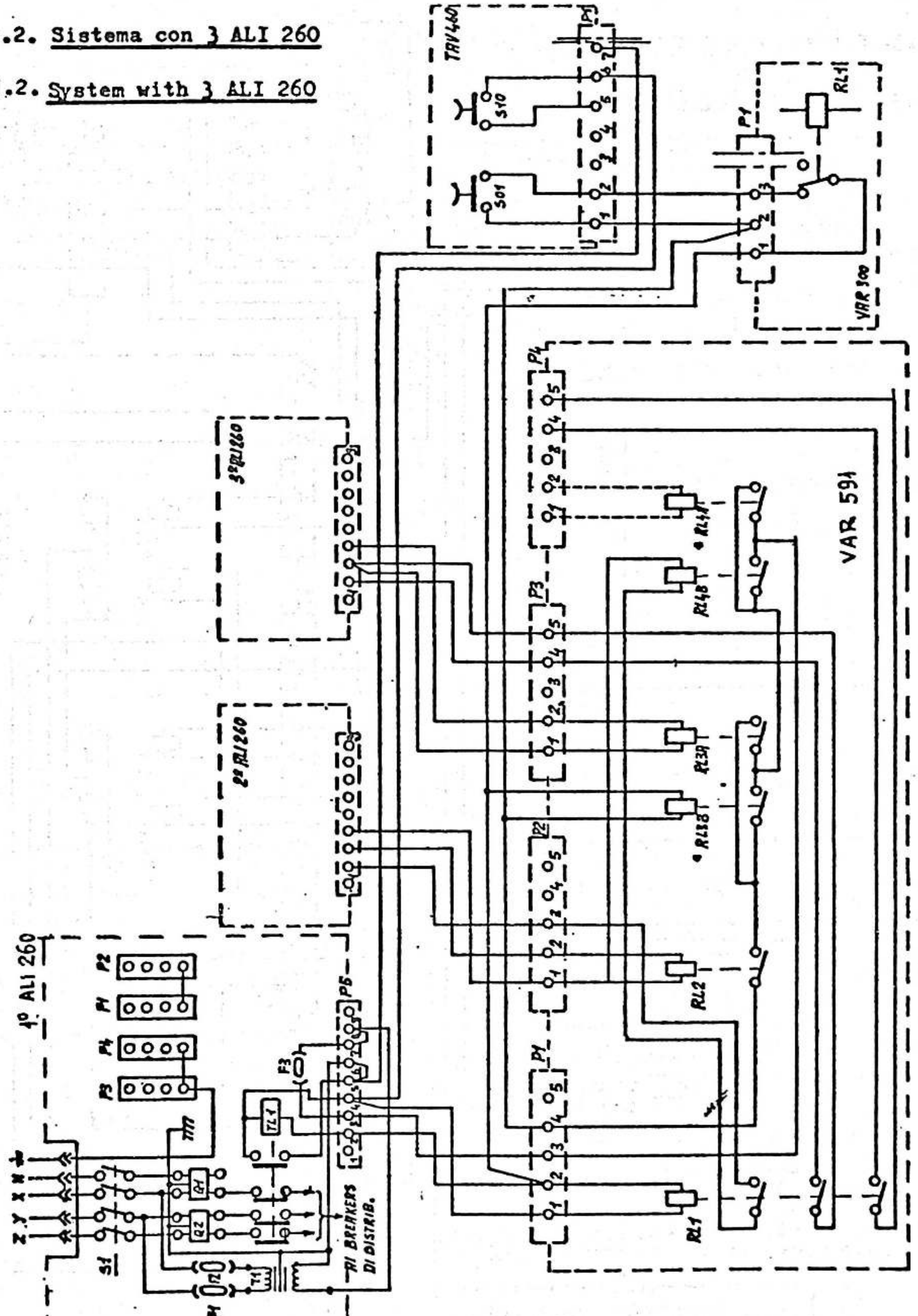
18.1.1. Sistema con 2 ALI 260

18.1.1. System with 2 ALI 260



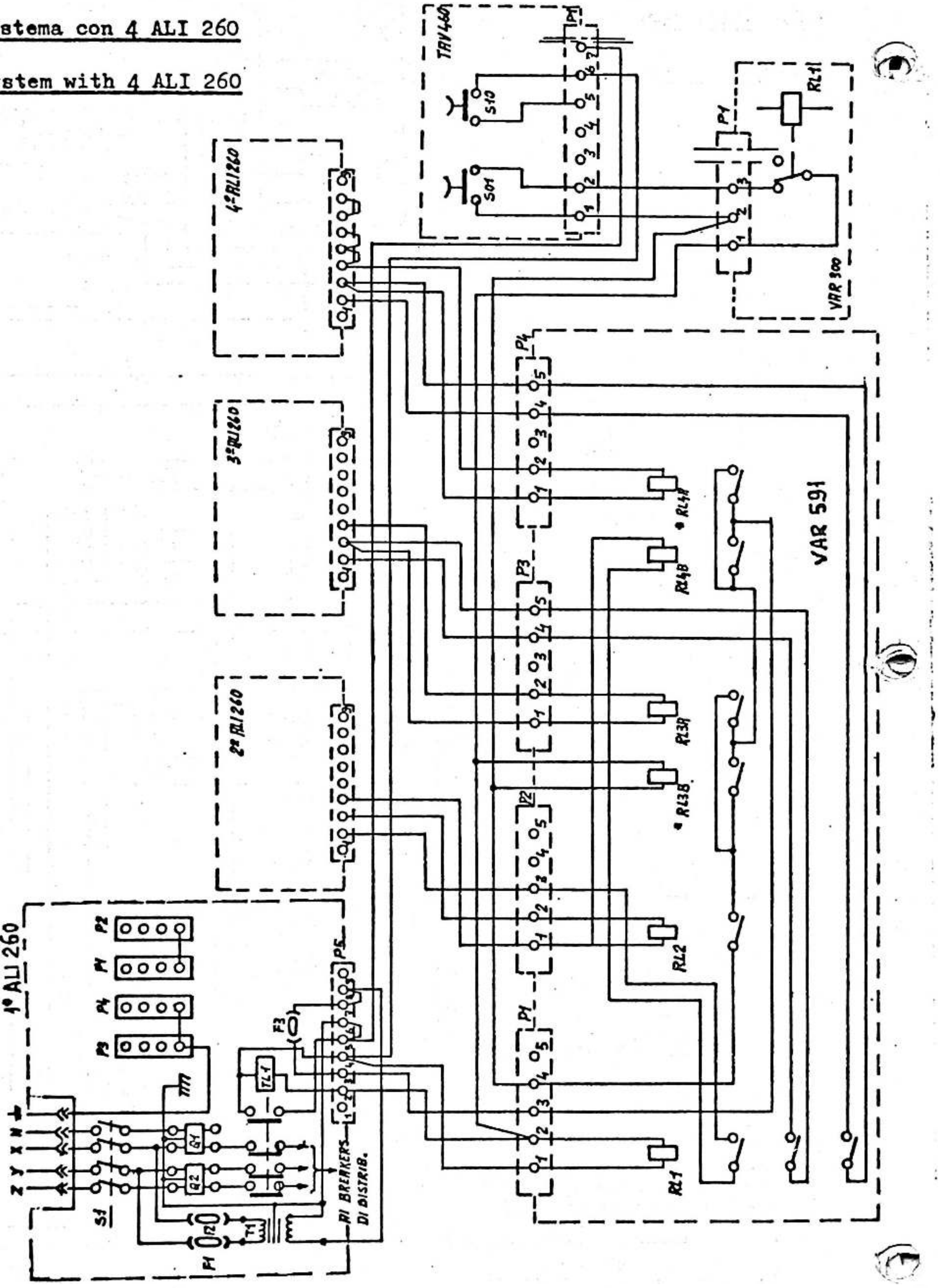
18.1.2. Sistema con 3 ALI 260

18.1.2. System with 3 ALI 260



18.1.3. Sistema con 4 ALI 260

18.1.3. System with 4 ALI 260



18.2. Riferimento documentazione

18.2. Documentation reference

Unità elementari interessate	N. Disegno	Riferimento documentazione
Interested elementary units	Drwg. No.	Documentation reference
ALI 260 I	144330 17	SOTTOSISTEMA MZ4 MZ4 SUBSYSTEM
ALI 260 II	"	
ALI 260 III	"	SOTTOSISTEMA GUN GUN SUBSYSTEM
ALI 260 IV	"	
TAV 460	144320 02	SOTTOSISTEMA CONSOLE CONSOLE SUBSYSTEM
VAR 300	146420 54	ALIMENTATORE POWER SUPPLY
VAR 591	140340 23	SOTTOSISTEMA MZ4 MZ4 SUBSYSTEM

18.3. Tabella componenti

18.3. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
F1-F2-F3	ALI 260 (GENERICO)	Fusibili da 0,5A - 0,5A - 3A 0,5A - 0,5A - 3A fuses
EMERGENCY OFF (Tasto rosso)	TAV. 460	Diseccita il teleruttore TL1 su tutti gli ALI 260. Toglie la tensione alternata a tutti gli utilizzatori del sistema Disenergizes the TL1 remote switch on all the ALI 260. Interrupts the A.C. voltage on all the system users.

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
"AC ON"	TAV 460	Eccita il teleruttore TL1 su tutti gli ALI 260. Comanda la distribuzione della tensione alternata a tutti gli utilizzatori abilitati del sistema
		Energizes the TL1 remote switch on all the ALI 260. It issues the A.C. voltage distribution to all the enabled system users.
P1 P2	ALI 260 (GENERICO)	Morsettiere isolate da massa alle quali fa capo il filo neutro.
		Terminal boxes insulated from ground to which the neutral goes.
P3 P4	ALI 260 (GENERICO)	Morsettiere collegate a massa alle quali fa capo il filo di terra
		Terminal boxes connected to ground to which the ground goes
Q	ALI 260 (GENERICO)	Celle antidisturbi
		Anti-noise celles
RL1	VAR 300	Diseccitato in funzionamento normale. Si eccita quando un microswitch della protezione ventilatori per guasto proprio o di un ventilatore, non si apre (vedi VAR 300)
		Not energized in normal performance. It is energized when a microswitch of the fans protection does not open because of its failure of a fan failure (refer to VAR 300)

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
RL1	VAR 591	Eccitato in funzionamento normale. Si eccita con il tasto ~ON (Tav. 460) Energized in normal performance. It energized by the ~ ON key (TAV 460).
S1	ALI 260 (GENERICO)	Main breaker - In condizioni di normale funzionamento è in posizione ON. In posizione OFF non permette l'alimentazione in alternata del sistema. Main breaker - In normal performance conditions it is ON position. In OFF position it does not allow the supplyng in A.C. of the system.
RL3A-RL3B RL4A-RL4B	VAR 591	Eccitati in funzionamento normale secondo la distribuzione riportata sui relativi schemi Energized in normal performance according to the distribution given on the related diagrams.
T1	ALI 260 (GENERICO)	Trasformatore di servizio 220/24 V Service transformer 220/24V
TL1	ALI 260 (GENERICO)	Teleruttore eccitato in funzionamento normale. Si eccita con tasto ~ON, si diseccita con tasto EMERGENCY OFF (tasto rosso). Consente la distribuzione delle alternate ai sottosistemi abilitati, attraverso i relativi breakers Remote switch energized in normal performance. It is energized by the ~ON key, it is disenergized by the EMERGENCY OFF key (red key). It allows the distribution of the A.C. power to the enabled subsystems, through their breakers.

18.4. Sequenza di controlli sui circuiti di alimentazione alternate

1) Verifica della posizione in "ON " dei main breakers.
2) Verifica della esistenza della tensione di rete.
3) Verifica dei fusibili F1-F2-F3 su tutti gli ALI 260.
4) Verifica della connessione della presa Hubbel dal lato ALI 260(prova di trazione).
5) Verifica sulla console operativa della integrità dei tasti ON ed EMERGENCY OFF (tasto rosso).
6) Verifica del VAR 300 (vedi pag. 129) nel piede dell'alimentatore.
7) Verifica dei relé del VAR 591 nel piede dell'ala MZ4 (ala B).
8) Verifica del corrento collegamento dei cavi alle morsettiere.

18.4. Sequence of controls

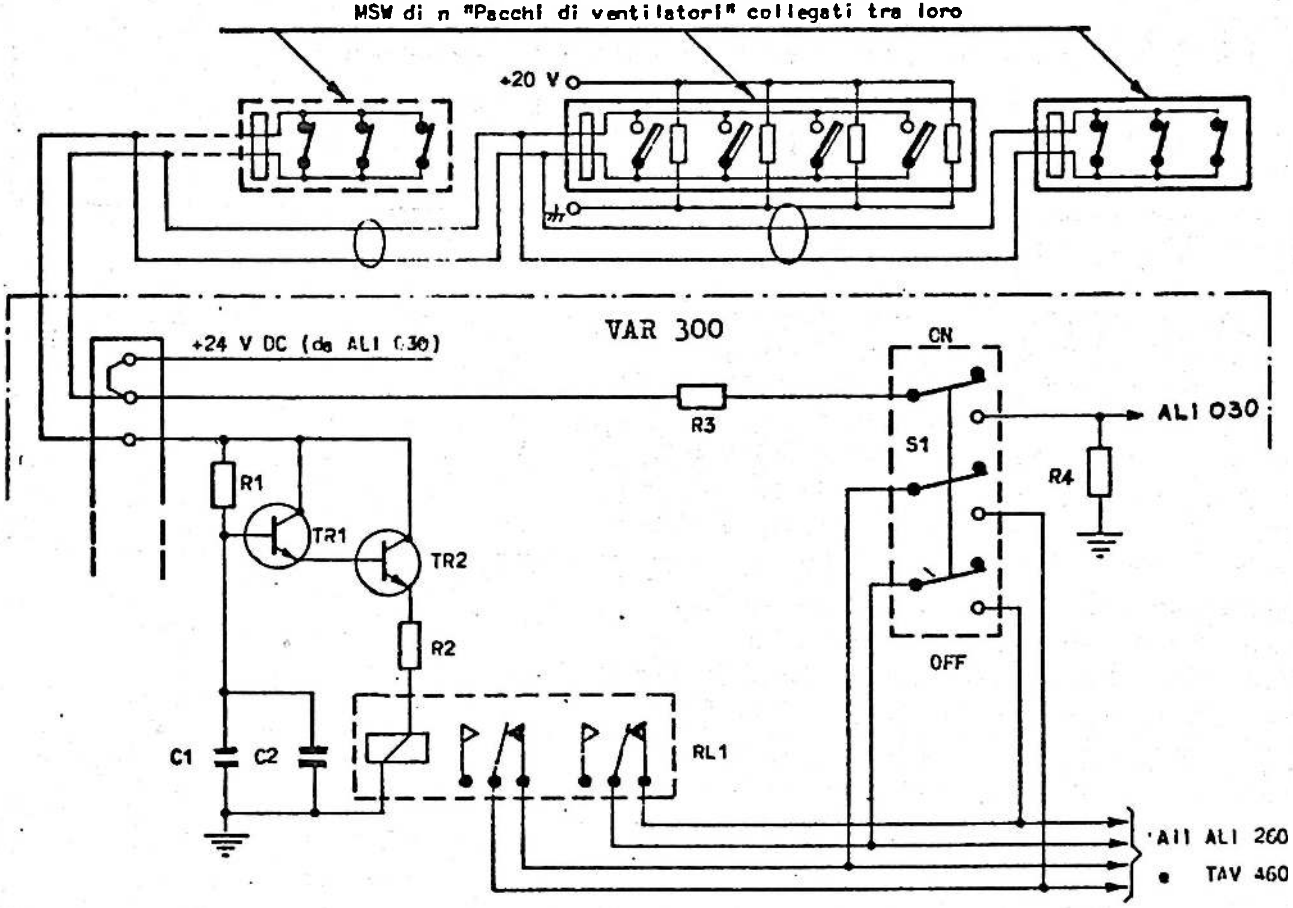
1) Check the position on "ON" of the main breakers.
2) Check the existance of the mains.
3) Check fuses F1-F2-F3 on all the ALI 260.
4) Check the connection of the Hubbel plug on the ALI 260 side (pulling test).
5) Check on the operating panel the integrity of keys ON and EMERGENCY OFF (red key).
6) Check the VAR 300 (see page 129) in the power supply base.
7) Check the relays of the VAR 591 in the MZ4 wing base (wing B).
8) Check the correct connection if the cables to the terminal boxes.

19. VAR 300 - PROTEZIONE VENTILATORI

19.1. Schema elettrico

19. VAR 300 - FANS PROTECTION

19.1. Electric diagram



19.2. Riferimenti documentazione

19.2. Documentation reference

Unità elementari interessate	N° Disegno	Riferimento documentazione
Interested elementary units	Drwg. No.	Documentation reference
VAR 300	14642054	Alimentatore Power supply
VAR 321	14634028	Unità centrale Central processor
ALI 030	14431010	

19.3. Tabella componenti

19.3. Components table

Componenti in ordine alfabetico e numerico	Unità elementari interessate	Funzioni elettriche e logiche
Components in alphabetical and numerical order	Interested elementary unit	Electric and logic functions
RL1	VAR 300	Diseccitato in condizioni di normale funzionamento. Si eccita quando uno (o più) termoswitch di protezione per guasto proprio, per rallentamento o arresto di uno (o più) ventilatori si chiude. L'eccitazione di RL1 determina lo spegnimento delle alternate del sistema.
		Not energized in normal performance conditions. It is energized when one (or more) protection thermoswitch, because of its failure for slowing down or stopping of one (or more) fans closes. The energization of RL1 determines the switching off of the system AC.
S1	VAR 300	Deviatore a levetta normalmente posizionato in "ON". Se posizionato in "OFF" determina l'accensione della lampada "TEMPERATURE" sull'ALI 030 e non consente l'accensione delle continue.
		Lever switch normally set on "ON". If positioned on "OFF" it determines the turning on of the "TEMPERATURE" lamp on the ALI 030 and does not allow the powering on of the D.C. voltages.

19.4. Sequenza di controlli del VAR 300

1) Verificare i fusibili di ALI 032 (Ved. 6.5.)

2) Su VAR 300 verificare che "S1"sia in posizione "ON".

3) Su VAR 300 con alternate accese verificare la presenza del +24 V sulla morsettiera P1 piedino 10 (misura rispetto massa).

4) Su VAR 300, con alternate accese verificare l'assenza della tensione +24V sulla morsettiera P1 piedino 11. In caso contrario rintracciare il microswitch responsabile e verificare quindi l'efficienza del relativo sistema di ventilazione (ventilatori, filtri, ecc).

19.4 VAR 300 CONTROLS SEQUENCE

1) Check the ALI 032 fuses (see 6.5).

2) On VAR 300 check that "S1" be in position "ON".

3) On VAR 300 with the mains on, check the presence of the +24V on the pin 10 of the P1 terminal box (measure with respect to ground)

4) On VAR 300, with the mains on, check the absence of the +24V voltage on the pin 11 of the P1 terminal box. In the opposite case, locate the responsible microswitch and check then the efficiency of the related ventilation system (fans, filters, etc).

20. SCONNESSIONE ELETTRICA DELL'UNITA' DI ALIMENTAZIONE SCR

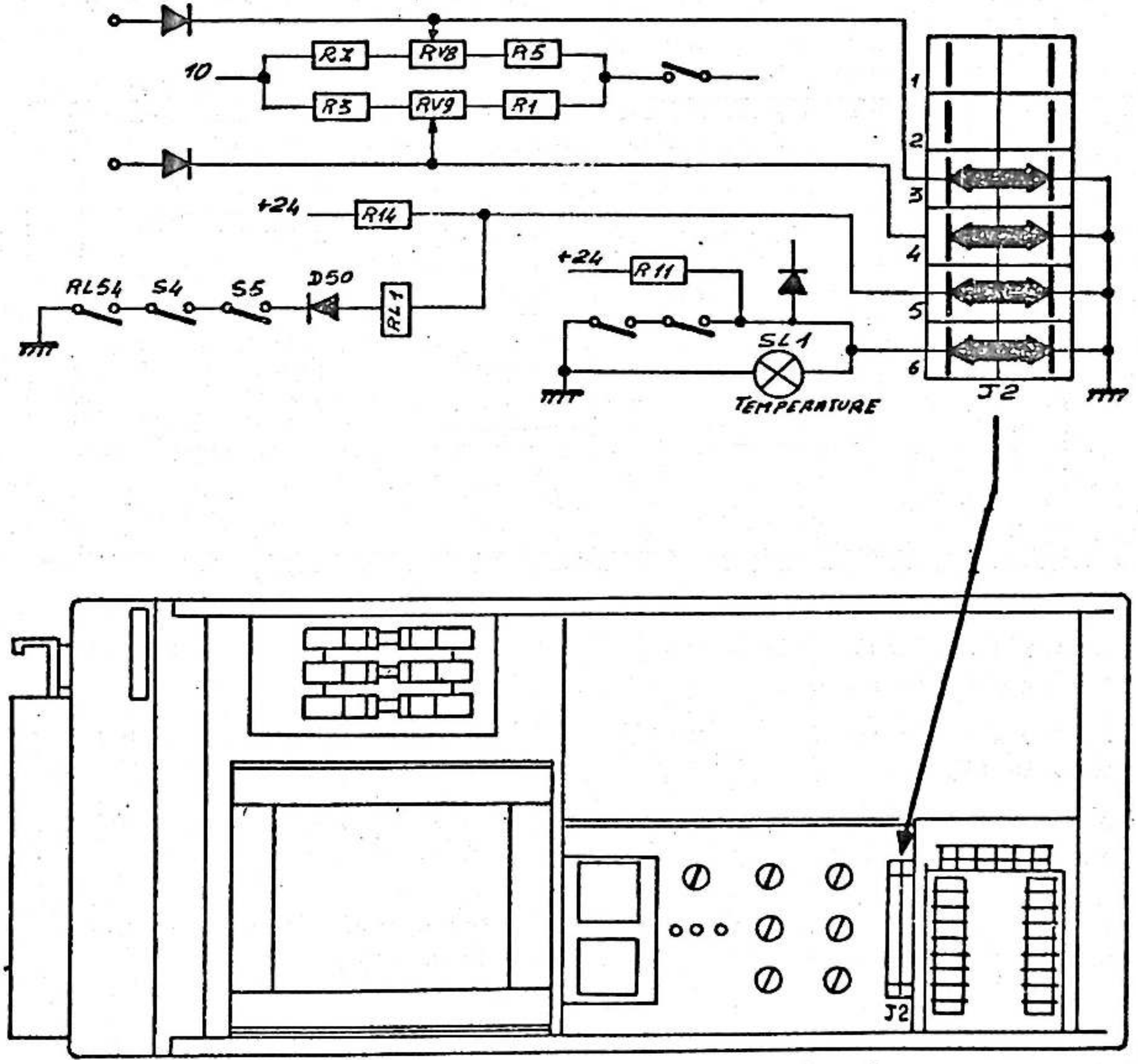
1) Realizzare i 4 ponticelli come indicato in figura.

2) Accendere l'alimentatore con POWER ON.
In queste condizioni deve funzionare solamente la parte di alimentatore sul quale non si sono eseguiti i ponticelli. (ALI 150).

20. ELECTRIC DISCONNECTION OF THE POWER SUPPLY UNIT SCR

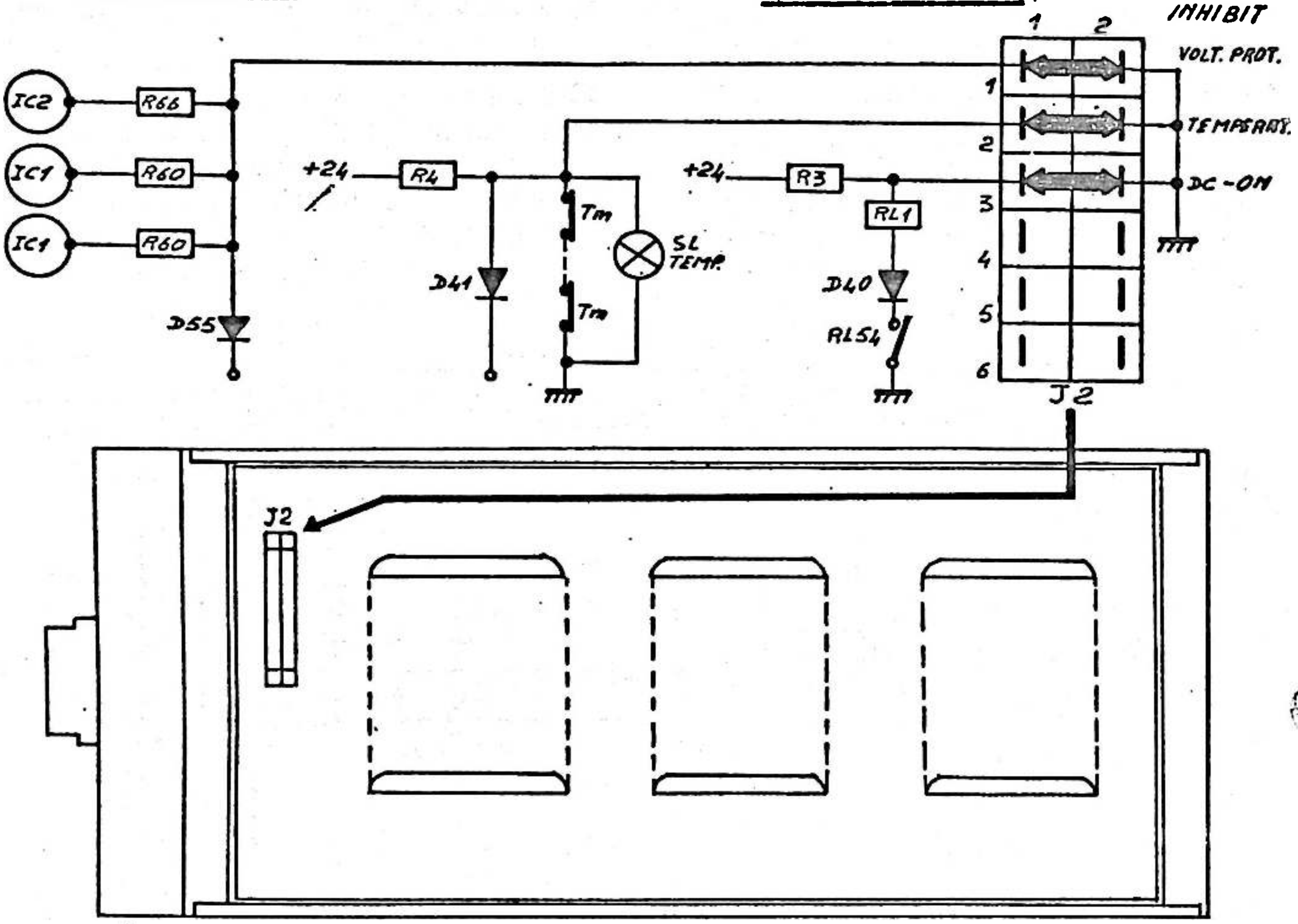
1) Assembled the 4 trappings as given in figure.

2) Turn on the power supply by means of POWER ON. In these conditions, only the part of the power supply without the strappings must work. (ALI 150).



21. SCONNESSIONE ELETTRICA DELL'UNITA' DI ALIMENTAZIONE ALI 151 DALL'ALIMENTATORE

21. ELECTRIC DISCONNECTION OF THE POWER SUPPLY UNIT ALI 150 FROM THE POWER SUPPLY



1) Scollegare il carico di macchina portando i 4 sezionatori in posizione 2 (carico interno).

2) Realizzare i 3 ponticelli come indicato in figura.

3) Accendere l'alimentatore tramite il pulsante POWER ON.

In queste condizioni deve funzionare solamente l'alimentatore SCR.

1) Disconnected the machine load set the 4 breakers in position 2 (internal load).

2) Assembly 3 strappings as given in figure.

3) Turn the power supply on by means of the POWER ON switch.

In these conditions, only the SCR power supply must work.

22. ASSORBIMENTI INDICATIVI SULLA TENSIONE + 20 V PER I SOTTOSISTEMI PIU' COMUNI

CONSOLE TAV 460 CON SIN 440	5 A
STAMPANTE PARALLELA MZ4/300 LPM	7 A
STAMPANTE PARALLELA MZ4/600 LPM	9 A
STAMPANTE PARALLELA MZ4/800 LPM e MZ4/1100 LPM	15 A
LETTORE SERIALE LS 600	8 A
LETTORE SERIALE CR 10	5 A
UNITA' NASTRO UN 35/75	2 A
GOVERNO U.N. 7/9 TRACCE	15 A
GOVERNO U.N. 7 TRACCE	8 A
MEMORIA A DISCHI DSS 130	9 A
PERFORATORE SERIALE	7 A
PERFORATORE P301	7 A
LETTORE E PERFORATORE LP 300	13 A
FOTOLETTORE FTL 400/500	6 A
DATANET DN9	6 A
DATANET DN/10 DN/12	4 A

22. INDICATIVE ABSORPTIONS ON THE +20 V VOLTAGE FOR THE MOST COMMON SUBSYSTEMS

CONSOLE TAV 460 WITH SIN 440	5A
PARALLEL PRINTER MZ4/3PP LPM	7A
PARALLEL PRINTER MZ4/600 LPM	9A
PARALLEL PRINTER MZ4/800 LMP AND MZ4/1100 LPM	15A
SERIAL READER LS 600	8A
SERIAL READER CR 10	5A
TAPE UNIT UN 35/75	2A
U.N. 7/9 TRACKS CONTROLLER	15A
U.N. 7 TRACKS CONTROLLER	8A
DISC MEMORY DSS 130	9A
SERIAL PUNCH	7A
P 301 PUNCH	7A
LP 300 READER PUNCH	13A
FTL 400/500 TAPE READER	6A
DN9 DATANET	6A
DN10 DN12 DATANET	4A